# ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS

THE
**MANUFACTURERS' DIRECTORY**
IN THIS ISSUE

McGRAW-HILL CO. OF CALIF. **APRIL 1938** PRICE 25c PER COPY

# Widening the Appliance Market

## The All-Electric Kitchen Gets Tremendous Publicity Through our Technicolor Picture

### *"Mrs. Mortimer Jones Prepares Dinner for Eight"*

Literally hundreds of thousands of women have seen and applauded Edison's Technicolor film featuring the convenience of the all-electric kitchen. This picture is in constant demand by clubs, church societies, and PTA's throughout Edison territory. It shows in detail just how a modern homemaker goes about the preparation of a company dinner in a well-equipped electric kitchen. Many home economics classes in the high schools use it as part of their regular course of instruction. This is just one more way in which the Edison Company is selling the electric idea, helping to widen the market for appliances and make sales easier for the dealer.

**SOUTHERN CALIFORNIA EDISON COMPANY LTD.**

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), April, 1938, Vol. 80, No. 4. Published monthly by the McGraw-Hill Company of California, 883 Mission St., San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shilling). Single copy, 25c.
Copyright, 1938. McGraw-Hill Company of California.

*The All-Industry Magazine of Progress*

# ELECTRICAL WEST

MEMBER AUDIT BUREAU OF CIRCULATIONS

ESTABLISHED 1887 AND INCORPORATING THE "ELECTRICAL JOURNAL," "JOURNAL OF ELECTRICITY, POWER & GAS" AND "JOURNAL OF ELECTRICITY"

McGRAW-HILL COMPANY OF CALIFORNIA
883 Mission Street, San Francisco

James H. McGraw
Chairman of the Board
George C. Tenney, Vice-President

R. A. Balzari, President
Roy N. Phelan
Secretary and Treasurer

## CONTENTS FOR APRIL, 1938 — VOL. 80, NO. 4

**Electra's Husband** ..... 29

**Danger of Electric Shock**.....Charles F. Dalziel 30

**An Answer to Fish Screening**.....J. O. Case 32

**Engineering**

**Distribution Transformer Protection**....George W. Westcott 34

**Pilot Wire Relaying**.....T. T. Smith 35

**Meridians for Electric Rates**.....George Fleming 37

**Northwest Transmission Practice**.....
Lester R. Gamble and Earl Baughn 38

**Vacuum Tubes in Action**.....H. C. Stanley 42

**Rural Loadbuilding**
**Regulations for Farm Wiring**.....George E. Kimball 43

**Lighting and Wiring**..... 45

**Maintenance** ..... 50

**Sales Parade** ..... 51

**Appliance Sales Guide—Refrigerators**..... 57

**Associations** ..... 61

**Editorial** ..... 62

**News of the Industry**..... 64

**Manufacturers' Directory** ..... 81

**Where to Buy in the West**..... 90

**Cover from a photo by Westinghouse**

George C. Tenney, Editor
Wayne Snowden, Engineering Editor
Roy N. Phelan, Manager

W. A. Cyr, Associate Editor
Stanley Schuler, Assistant Editor
Hans Hjorth, Typography

**Editorial Advisory Board—**

UTILITIES: R. E. Fisher, Vice-President in Charge of Public Relations and Sales, Pacific Gas and Electric Company, San Francisco; J. A. Hale, Vice-President, Utah Power & Light Company, Salt Lake City; Glenn L. Jackson, Vice-President and Commercial Manager, The California Oregon Power Company, Medford; Frank McLaughlin, President, Puget Sound Power & Light Co., Seattle; L. T. Merwin, President, Northwestern Electric Company, Portland; W. C. Mullendore, Executive Vice-President, Southern California Edison Company, Ltd., Los Angeles . . . MANUFACTURERS: Vernon Brown, Vice-President, Square D Company, Los Angeles; W. R. Marshall, Vice-President, Westinghouse Electric & Mfg. Co., San Francisco; A. S. Moody, Northwest Manager, General Electric Company, Portland . . . WHOLESALERS: J. I. Colwell, Northwest Manager, Graybar Electric Co., Inc., Seattle; N. W. Graham, Graham-Reynolds Electric Co., Los Angeles . . . CONTRACTORS: Lloyd Flatland, Globe Electric Works, San Francisco; S. G. Hepler, Arrow Electric Co., Seattle . . . DEALERS: H. H. Courtright, President, Valley Electrical Supply Company, Fresno; J. C. Chamberlain, Secretary-Manager, Bureau of Radio and Electrical Appliances, San Diego.

## FABLE BY AESOP

WHILE walking through a forest one day in search of food a Wolf chanced to meet a Fox. "Fox," he said, "I am very hungry. Can you give me something to eat?" ❧ The Fox, who was a crafty fellow and hated the Wolf because he always carried off what did not belong to him, thought for a moment before answering. Then he said, "Yes, Wolf I can. Come with me and I shall show you where there is a big fat hare I have killed." ❧ So the Fox and the Wolf walked off together and after a time they came to a tree in which there was a little hole. "The hare is way back in there," the Fox said and he stepped aside as the Wolf rushed to the hole and stuck his head inside. ❧ The Wolf pushed with all his might but he couldn't get his shoulders into the cavity. Finally he gave up. "Fox," will you get it for me?" ❧ "Gladly," said the Fox and he crawled through the hole. Once within he picked up the hare and began to eat with great gusto. "You see how easy it is to get in, Wolf?" he said, laughing at his own cleverness. "It is a question only of size." ❧ BEFORE TACKLING A PROBLEM, THE WISE MAN DETERMINES ITS SIZE. ❧❧ If this moral is true, then it is also true that before installing wiring in a home the contractor should determine how much wiring is necessary. ❧ No imagination is needed to recognize the fact that adequate wiring is vital to home-owners and the electrical industry. Adequate wiring benefits everyone. And whatever is beneficial to the world must be done. ❧ It is for this reason that the National Adequate Wiring Bureau is so strenuously campaigning this year. It is for this reason that ELECTRICAL WEST has been campaigning for adequate wiring for years. ❧ ELECTRICAL WEST devotes its pages to any movement which will build more business for the Western electrical industry. And because ELECTRICAL WEST is the common meeting place for all the brains of the electrical industry, these pages contain news, ideas and suggestions helpful to every single man. ❧ Read ELECTRICAL WEST and watch your business prosper.

# FIRST AID FOR HOT WEATHER NERVES!

GENERAL ELECTRIC

*Super-Quiet Fans*

## AMAZING, NEW G-E SUPER-QUIET FAN

The world's champion breeze maker! Moves tremendous volumes of air at high velocity, and with extremely quiet operation, due to revolutionary new G-E Vortalex Blades—an exclusive General Electric development. It pays to stay with the leader!

## THE "MAINLINE" AND PROFIT LINE FOR 1938!

**Tie in with G-E Fans for 1938 and get your share of the profits that General Electric Fan Dealers will enjoy! You'll have four lines of fans—Super-Quiet, Quiet, Standard and Junior—and brilliant new sales and advertising helps featuring a brand new "HOT WEATHER NERVES" consumer approach!**

**The salesman of your local G-E Fan Distributor has the facts in a new portfolio entitled, "THREE GOLDEN REASONS WHY YOU WILL PROFIT WITH GENERAL ELECTRIC FANS." Ask to see it! You'll profit by it!**

**Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.**

# GENERAL ELECTRIC

# *New* STEP-SAVING KITCHEN APPLIANCE

*Close-up showing Monel sink and Westinghouse electric range combination as manufactured by Whitehead Metal Products Company, Inc., New York, N. Y. Lower view shows one of 48 of these units which were installed in the Philby Apartments, Detroit, Mich.*

## SALES UP . . . . *helps* STEP

***Electric range combined with all-Monel sink and work surfaces offers unusual convenience and lasting beauty***

Take a look at this new electric kitchen unit. Show it to your customers. Here, in one compact piece of equipment, you find the popular appeal of a modern Monel* kitchen.

Consider what this new Monel-topped unit brings to your customers: The speed and efficiency of a modern electric range . . . the convenience and advantages of a lustrous Monel sink . . . the convenience of sturdily constructed, built-in cabinets. And topping all... the lustrous, silvery beauty of the one-piece top of enduring Monel.

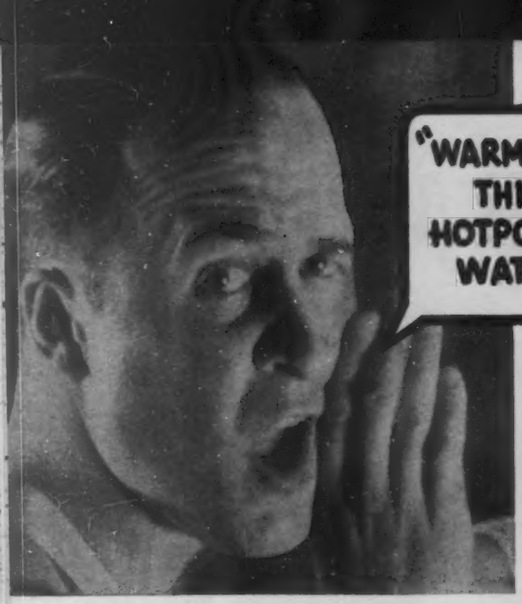
Never before have you been able to offer such big value in one compact, step-saving unit. Display it in your showroom. Show it to owners of homes and apartments. Admiration will be won immediately. And orders will quickly follow. For housewives and property owners the country over want beauty and convenience in kitchen equipment . . . and know Monel spells both. They see this durable, lustrous household metal consistently advertised in leading magazines . . . know it graces fine homes from coast to coast.

Get further information on this Monel sink and electric range combination. Call in a representative of the maker. Or write to:

**THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y.**

**MONEL** INCO MONEL

*MONEL is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. This alloy is mined, smelted, refined, rolled and marketed solely by International Nickel.



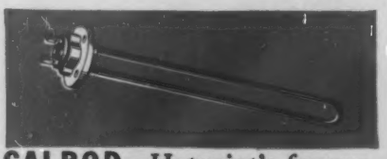

# FROM COAST TO UTILITIES ACCLAIM HOTPOINT WATER

EVERYWHERE, forward-looking utility companies are launching aggressive water-heating campaigns earlier than ever this year. They know an early start means more sales—greater profits—every month of the year. Why don't you, too, start your campaign now?

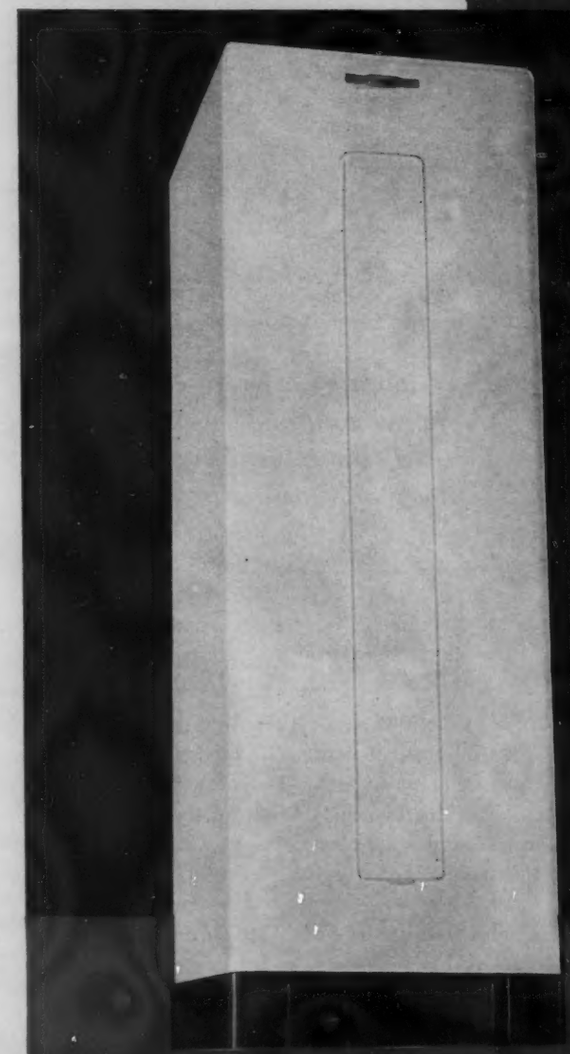
Many utilities have planned, and are conducting, special drives to sell their present electric range users. They're increasing KW hour sales and revenue with a minimum of investment. Hotpoint's special sales promotion materials will help you sell this profitable market.

Take advantage of the sweeping public interest in electric water heating. The modern electric water heater is the fastest growing domestic appliance in the industry. Everything points to the biggest year in water heater history. It's an opportunity you can't afford to neglect.

Whether your requirements are for off-peak or continuous service, Hotpoint's complete line offers a model to fit your needs. Hotpoint Vogue and Master models are offered in capacities from 1 to 140 gallons—a model for every demand. See the complete line. Build revenue and good will with Hotpoint Electric Water Heating in 1938!



**CALROD**—Hotpoint's famous heating unit is immersed directly in the water within the storage tank. Delivers heat directly into the water.



**THE VOGUE**—Hotpoint's smartly-styled rectangular type water heater, combining modern beauty of design with Hotpoint economy and efficiency. Adaptable to kitchen, bathroom or basement installation.

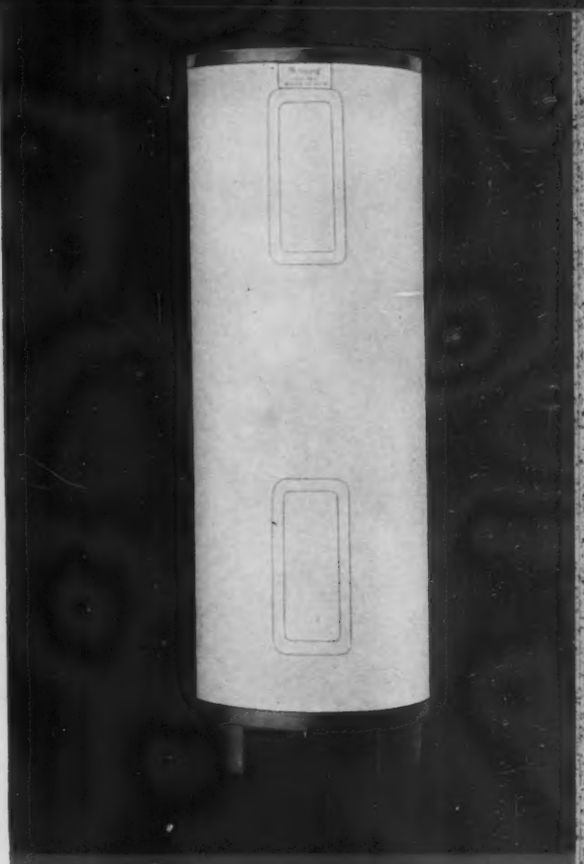
**EDISON GENERAL ELECTRIC APPLIANCE CO., Inc.**
5612 West Taylor Street, Chicago, Illinois

# COAST...CANADA TO THE GULF OPPORTUNITIES OF...

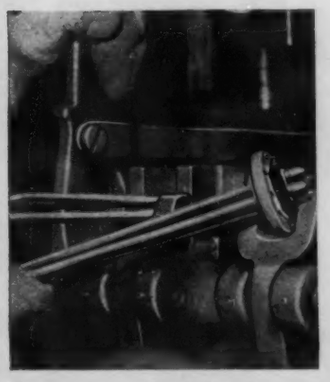
# ELECTRIC HEATING

## SMARTLY-STYLED...

## ENGINEERED FOR SATISFACTION

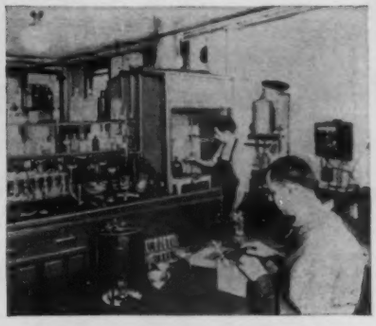


**THE MASTER**—Hotpoint's popular round-style water heater for homes which prefer this type of design. Offered in a wide variety of capacities to provide dependable hot water service for all needs.



**SEALING CALROD UNIT WITH BAKELITE**—One of the precision manufacturing operations insuring perfection of the Hotpoint Water Heater. Calrod is an exclusive feature of Hotpoint Water Heaters.

**MATERIALS TESTING LABORATORY**—(*below*) Here, all materials to be used in the manufacture of Hotpoint Water Heaters are subjected to severe and rigorous tests to protect quality.



**USE THESE NEW HOTPOINT SALES HELPS**

New newspaper advertisements, direct-mail, display material, slide films—a variety of sparkling sales helps aimed right at the purse strings of your prospects.

# Hotpoint

## AUTOMATIC ELECTRIC WATER HEATERS

ELECTRIC RANGES • REFRIGERATORS • WASHERS AND IRONERS • SINKS AND DISHWASHERS

# NESCO Announces "LUCKY 7" PROGRAM!

**7 MODELS**
An Electric Roaster to fit every individual's personal requirements!

**7 PRICES**
No lost sales . . . 7 models in 7 different price classes . . . a Roaster to fit every purse!

**7 YEARS**
NESCO leads the field in consumer acceptance built through 7 years of Roaster development and production!

**7 MERCHANDISING AIDS**
Consumer advertising. Cooking Schools. Consumer slide film. Point of Sale Displays. Consumer circulars. Recipe booklets. Trade paper advertising.

*Write for catalogue on complete 1938 line.*

**NATIONAL ENAMELING AND STAMPING COMPANY**
*Electrical Division, Executive Offices:*
272 E N. TWELFTH STREET MILWAUKEE, WISCONSIN
*Factories and Branches.* MILWAUKEE — CHICAGO — NEW YORK — BALTIMORE
PHILADELPHIA — GRANITE CITY, ILLINOIS — SAN FRANCISCO — DALLAS

WORLD'S LARGEST MANUFACTURER OF HOUSEWARES
INCLUDING ENAMELED WARE • JAPANNED WARE •

A NESCO PRODUCT

TINWARE • GALVANIZED WARE • ELECTRIC
APPLIANCES • KEROSENE RANGES AND HEATERS

# *Announcing* THE MONARCH MASTERPIECE

## A PORTABLE, "PLUG-IN" ELECTRIC RANGE OF FAMILY CAPACITY

We call it the "Masterpiece"— but it is really a milestone in the progress of electric cookery! For here, at last, is a real electric range at a price far below anything ever known in electric range history for a quality range of family capacity.

It's a "plug-in" range that requires only simple 2-wire connection, which involves but a nominal charge. It is the answer to the prayer of home and apartment renters and summer cottage owners. It's *portable!*

Yet, this is truly a *family range.* It has two full-size standard MONARCH "Hi-Efficiency" Surface Units. Its built-in roaster is an all-purpose cooker of 10-quarts capacity—a roaster large enough for a 12-pound fowl; and a baker for potatoes, rolls, pies, cakes and casseroles. It has standard "oven temperature control" and individual switches so all units may be operated at the same time.

*Write today for literature, photographs and prices.*

**MALLEABLE IRON RANGE CO.**
**34 North Lake St.**
**BEAVER DAM · WISCONSIN**

• • •

Model ER12A, equipped with heavy, 2-conductor heater cord and polarized 20-amp. attachment plug.

Model ER22A—high wattage, requiring standard 3-wire range connection.

### *Masterpiece operating efficiency is assured by exclusive Monarch features*

**MONARCH'S** Patented Roaster Oven equipped with lifter rack for general baking purposes, also for removing casserole dishes and whole meals.

Standard utensils of large capacity may be conveniently used on the two MONARCH "Hi-Efficiency" Surface Units, standard equipment on the MONARCH Masterpiece.

**MONARCH'S** Roaster Oven, full capacity 10-quarts, is adequate for roasting large fowl and baking whole hams. Roaster inset is inverted, when necessary, to increase depth.

**MONARCH'S** New Black-Vitrified, "Hi-Efficiency" Surface Unit. Fast, direct heat is produced from glowing coils imbedded in insulated porcelain, sanitary and stain-proof.

# OKOSHEATH

## A NON-METALLIC SHEATHED CABLE

## *Note Its Simplicity*

Just a tough rubber belt around the conductor. That is Okosheath. Simple in design—but it *lasts.*

There is nothing to deteriorate and rot away. Enormous quantities of Okosheath, used both in conduit and buried directly in the ground, have demonstrated its durability.

Okosheath is effectually moisture resistant. It is clean, smooth, flexible, light in weight, small in diameter; easy to handle and install. A lineman can splice it. Tough and compact, Okosheath is just the cable for the tough pulls.

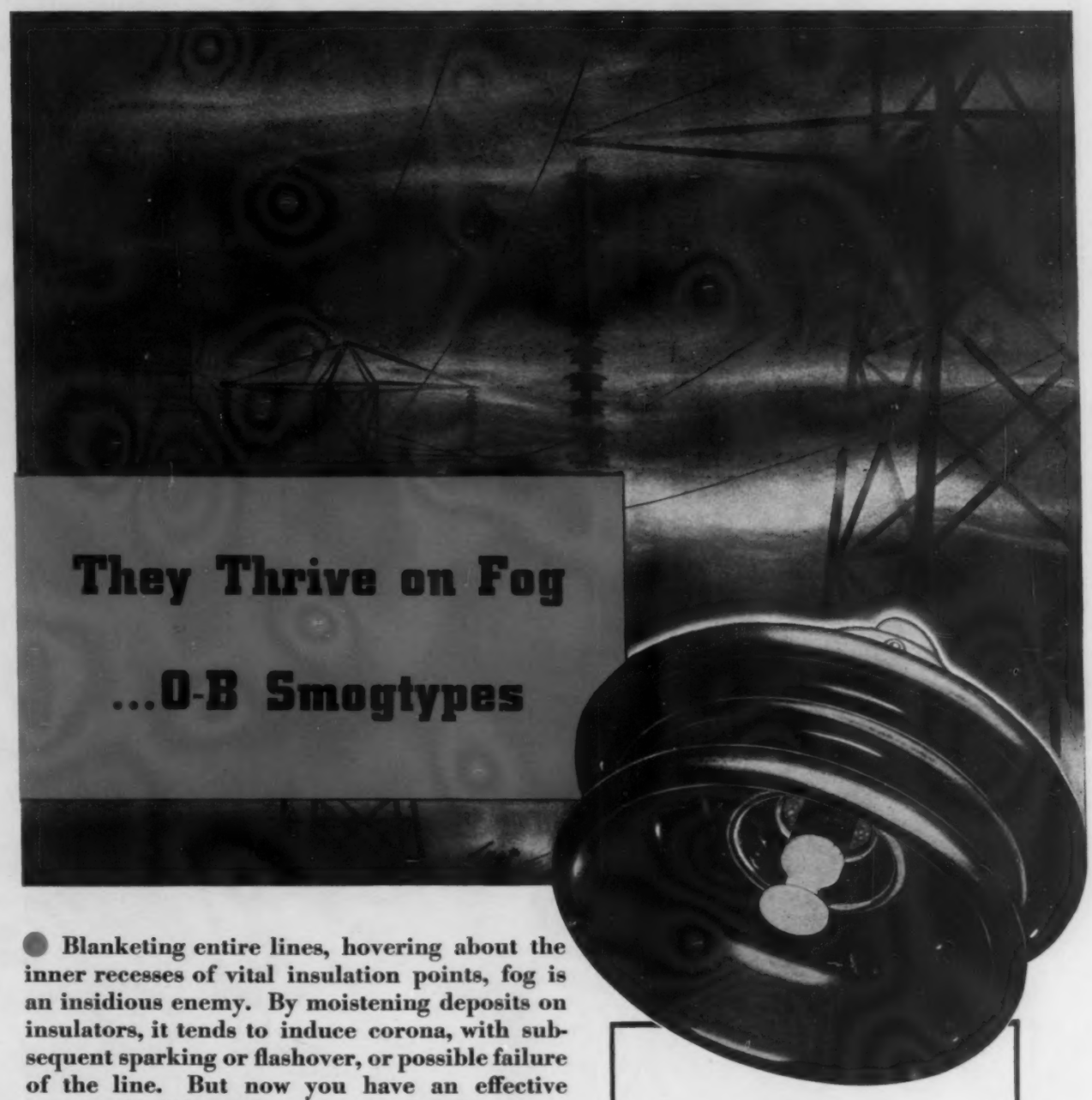
Okosheath opens the way for the new trends and demands. Besides lower first cost, it saves in maintenance. The dollar benefits are *both* ways.

**THE OKONITE COMPANY**
Founded 1878
and
HAZARD INSULATED WIRE WORKS DIVISION

THE OKONITE-CALLENDER CABLE COMPANY, INC.

EXECUTIVE OFFICE: PASSAIC, N. J.
New York · Boston · Chicago · Detroit
Philadelphia · Pittsburgh · Washington · San Francisco
Los Angeles · Seattle · Buffalo · St. Louis · Dallas · Atlanta
Factories: Passaic, N. J. · Wilkes-Barre, Pa. · Paterson, N. J.

OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION



# They Thrive on Fog

# ...O-B Smogtypes

● Blanketing entire lines, hovering about the inner recesses of vital insulation points, fog is an insidious enemy. By moistening deposits on insulators, it tends to induce corona, with subsequent sparking or flashover, or possible failure of the line. But now you have an effective weapon for fighting fog—the new O-B Smogtype. With high surface resistance, exposed petticoating and a pin corrosion preventive, this unit is designed especially to function in fog. If any of your lines are in fog or other contamination areas—and if you would reduce the cost of insulation failure on these lines—install Smogtypes.

IT COSTS LESS TO USE O-B INSULATORS

## IN SMOGTYPES * . . .

- Surface resistance is 60 percent higher than a conventional unit.
- Wide-spaced petticoats allow maximum cleaning by wind and rain.
- A metal coating in the pin hole prevents pin corrosion.
- An ingenious flux control improves corona characteristics.
- Rugged sections decrease breakage from mechanical impact.

* Smog: A blend of smoke and fog.—*Webster.*

2007-H

50 YEARS of SERVICE
FOUNDED IN 1888

**OHIO BRASS**

MANSFIELD, OHIO

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

The Background of NATIONAL TRADE-MARK Carbon Brushes
·RESEARCH·
EXPERIENCE
RESEARCH IS THE BASIS OF ENGINEERING PROGRESS
● "National" Carbon Brushes are kept abreast of progress in allied fields of engineering and industry by a systematic program of research. New combinations of materials, new method of preparation, new manufacturing processes and new technique in application are some of the varied phases of development constantly under investigation.
● In the Research Laboratories of National Carbon Company, Inc., experienced engineers systematically seek ways of making a better product. Nothing is left to chance. New facts are sought. Effects are identified with cause. Theories are tested by experiment. Research supplements experience in the production of a superior product.
NATIONAL TRADE-MARK CARBON BRUSHES
KEEP YOUR MACHINE PERFORMANCE IN STEP WITH LATEST PROGRESS
"SA" Series Grades are the product of a four year program of research and development. They represent a distinct advance in brush manufacture.
Let us demonstrate their superiority.
NATIONAL CARBON COMPANY, INC., Carbon Sales Division, Cleveland, Ohio
Unit of Union Carbide UCC and Carbon Corporation
General Offices: 30 East 42nd Street, New York, N.Y.
BRANCH SALES OFFICES NEW YORK PITTSBURGH CHICAGO SAN FRANCISCO

# A Guinea Pig's Fate

## is an Easy One... by Comparison!

Like medical research through scores of guinea pig generations, General Cable **RESEARCH** on **NETWORK CABLE** has been a long sustained effort. Samples upon samples have been tested to destruction. Not by Geer oven and oxygen bomb aging tests alone, but by **SIMULATED FIELD CONDITION TESTS** that compress years into days:

**(a) periodic wetting or immersion while undergoing**

**(b) periodic loading equivalent to the fluctuation of an average load curve**

**(c) including exposure to acid, alkali or neutral moisture, with and without such an oil film as represents frequent seepage conditions in city streets**

**(d) and exposure to extremes of heat.**

If you are calculating a probable cost per circuit mile year of operation, these test figures and the performance records of millions of feet now in service are available. Our engineers will be glad to discuss your specific operating requirements.

**GENERAL CABLE CORPORATION**

**Sales Offices:** Atlanta • Boston Buffalo • Chicago • Cleveland Dallas • Detroit • Los Angeles New York • Philadelphia • Pittsburgh • Rome (N. Y.) • St. Louis San Francisco • Seattle Washington (D.C.)

Electrify with COPPER

GENERAL CABLE GENERAL CABLE GENERAL CABLE

**GENERAL CABLE**

# NETWORK CABLE

# *Home-proved* WATER HEATERS SELL EASIER

Home of Mrs. W. J. Hoarty, Boise, Idaho, one of many homes of various types where Westinghouse Water Heaters were proved in actual use.

From homes like this comes the most powerful selling story ever told — *a story built on facts.* Certified home tests *prove* Westinghouse Water Heaters give Real Hot Water Service — EASY, QUICK, CHEAP — just like electric light! Now — for the first time in water heater history — laboratory tests are backed by *Home-proof!*

*Home-proved facts* pack new punch into your advertising and selling, fill your salesmen with new enthusiasm.

*Home-proved facts* quickly convert hard-to-close prospects into satisfied users and make Westinghouse Water Heaters easier to sell!

Boost your sales and profits now, with the fastest selling, most complete line of electric water heaters in the industry — *the only line you can sell on Home-proved facts!*

STEP UP YOUR SALES WITH LOCAL PROOF

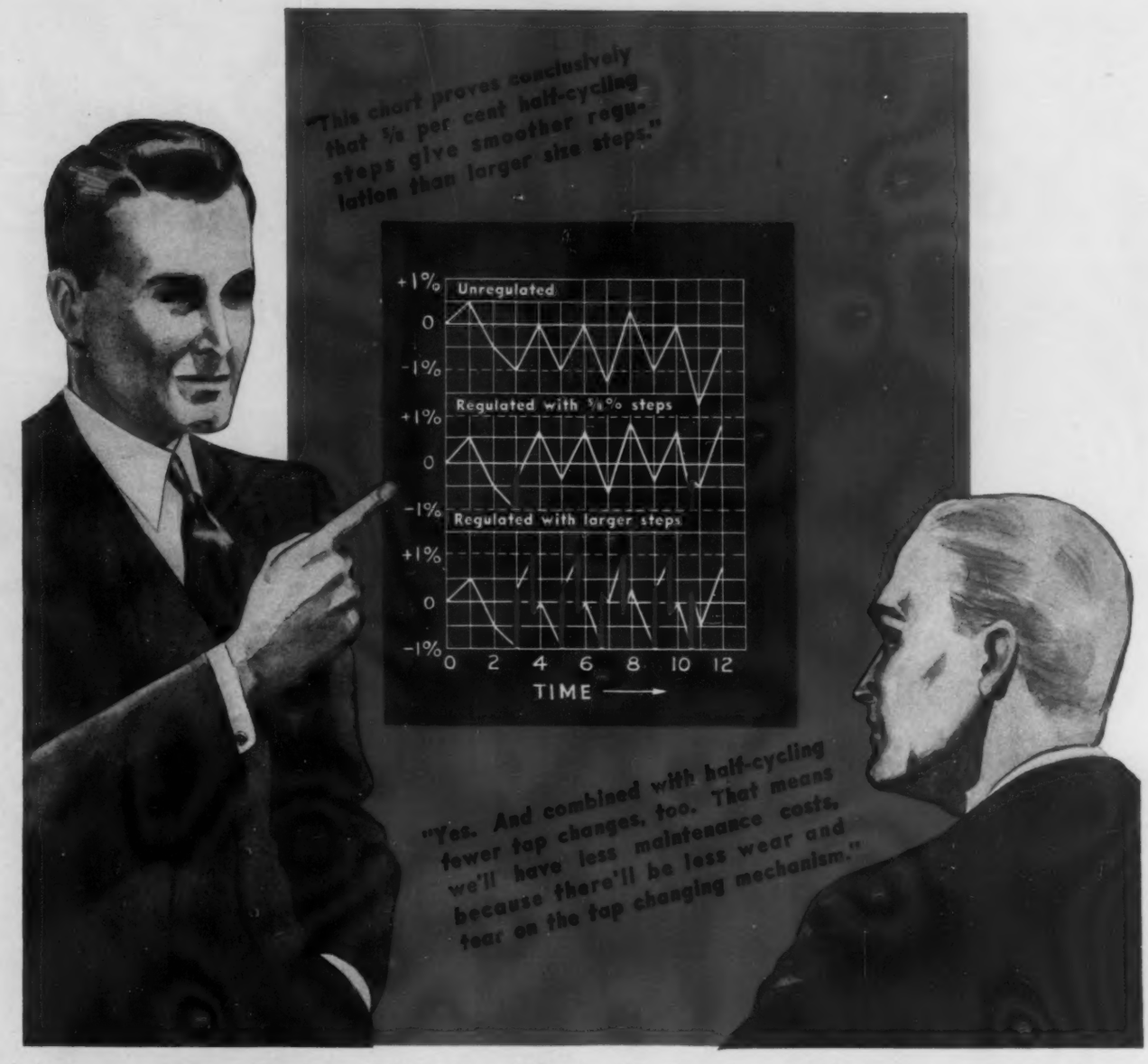
Get authentic sales-making Home-proved facts right in your own home town! Get scores of good prospects — free publicity — added sales-power! The "STEP UP YOUR SALES" book tells how. It's yours if you phone your nearest Westinghouse man, or write Dept. 8273, Westinghouse Electric and Manufacturing Co., Mansfield, Ohio.

MODERNIZE ELECTRIFY YOUR KITCHEN

Win valuable cash awards in the Modern Kitchen Bureau's national program.

## Westinghouse *Home-proved* Water Heaters

EVERY HOUSE NEEDS WESTINGHOUSE


"This chart proves conclusively that ⅝ per cent half-cycling steps give smoother regulation than larger size steps."
+1%
Unregulated
0
-1%
Regulated with ⅝% steps
+1%
0
-1%
Regulated with larger steps
+1%
0
-1%
0 2 4 6 8 10 12
TIME
"Yes. And combined with half-cycling fewer tap changes, too. That means we'll have less maintenance costs, because there'll be less wear and tear on the tap changing mechanism."

## ★ Increase Your Revenue With Allis-Chalmers ⅝ Per Cent Half-Cycling Step Regulators

You can't afford to have unregulated voltage on your lines, because that means loss of revenue and dissatisfied customers. And yet, if you invest in a step regulator, you want the utmost in regulation at the lowest possible cost. That is why the chart these men are studying has an important bearing on your profit and cost columns. Look at it closely. You can see at a glance that regulation with ⅝ per cent steps, plus half-cycling operation, makes voltage smoother and steadier — ***and does it with only two tap changes and two switching operations.***

Compare that record with that shown by the curve for larger size steps and full cycling. Voltage not as smooth, and, what's more, nine tap changes and eighteen switching operations in the same length of time. What does this mean to you? Just this: With ⅝ per cent steps and half-cycling you get closer regulation with fewer tap changes, and that means less contact deterioration and less maintenance costs. Many step regulators have appeared on the market since Allis-Chalmers first introduced the step regulator. But remember—Allis-Chalmers is still the only company that builds your step regulator with ⅝ per cent steps and half-cycling operation as standard equipment. And that means that only with the AFR (for station installation) and the DFR (for distribution systems) can you obtain the maximum in regulation at the minimum in costs. Choose the AFR or DFR units and discover for yourself how quickly they pay for themselves by increasing your revenue.

TRANSFORMER DIVISION
ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

# NEW DESIGN *that provides great mechanical strength*

## COMBINED WITH SUPERIOR ELECTRICAL PERFORMANCE

### 3 SIZES

TYPE 680—FOR VOLTAGES UP TO 15,000
TYPE 670—FOR VOLTAGES UP TO 10,000
TYPE 660—FOR VOLTAGES UP TO 8,000
Handle most PRIMARY line requirements

● Not only will the initial savings please you but their low-cost performance in the line will confirm your judgment in specifying the new series-600 Hemingrays.

Hemingray tougher glass insulators never age, are easy to inspect, and now provide greater leakage distance because of the new design.

Manufacturing processes are more accurately controlled than ever before, resulting in uniform production and dependability in service under heavy loading or severe weather conditions.

Make that next order read "Hemingray series-600 Glass Insulators"—they are brass-bushed for greatest strength. Send for samples.

Owens-Illinois Glass Company, Hemingray Division, Muncie, Indiana.

## FOR MODERN POWER LINE INSULATION

## *Order* HEMINGRAY Glass INSULATORS

# MOUNTING PROFITS
## *FROM MOVING AIR!*

**You can earn big profits by selling General Electric Air Circulators.**

**Everywhere, there will be a summer demand for devices that relieve oppressive summer heat. You can profit by supplying this demand with G-E Air Circulators! Quiet and economical, these low-cost Air Circulators offer lasting value—and they make lasting friends for you!**

**General Electric Air Circulators sell fast on demonstration. No complicated installation —just plug them in as you would an electric fan. You can sell a type of G-E Air Circulator for each and every purpose!**

*G-E Sales Aids to Help You Sell.*

***For:*** **Restaurants, Dress Shops, Night Clubs, Offices, Hospitals, Stores, Beauty Shops, Barber Shops, Laundries, Libraries, Dance Halls, Waiting Rooms and Homes.**

**General Electric Air Circulators provide effective ventilation, and circulation. They drive out hot air and odors—and they pull in fresh, cool night-time air.**

**The *Deluxe* model is particularly suitable for locations exposed to public view. If the establishment is large, or if constant smoke and odors necessitate more frequent air changes, suggest the *Giant*. The *Utility* model is adapted to attic installations, ceiling suspension or floor use—its closed construction makes it safe.**

**For positive profits, handle General Electric Air Circulators! Write your General Electric Distributor today. Or mail the coupon to the General Electric Company!**

**GENERAL ELECTRIC**
*Air Circulator*

General Electric Company
Air Circulator Department
Division 2540
Bloomfield, New Jersey
Please send complete information on G-E Air Circulators.

Name .....
Street ..... City .....

# INSTALL G-E HOME WIRING* ONCE AND MANY SIMILAR JOBS WILL FOLLOW

**NOW is the time to start. Spring building is under way. An installation of G-E Home Wiring now will act as a "bellwether" for all the homes you wire during the Spring, Summer and Fall. Your volume of work will increase surprisingly. G-E Home Wiring makes it worth your while to install residential wiring. More labor and more materials are required than on ordinary house wiring jobs.**

**Sell one prospective home owner or the builder of a sub-division. The word will travel. You'll have a model to point to. Your second customer will be easier to sell. The comfort and convenience of G-E Home Wiring when actually seen appeals to everyone. Switches provide pathways of light. Ample electrical current is supplied to all outlets.**

**G-E Wiring Materials will help you. The G-E name is well known making selling easier. The completeness and quality of the line make installation easier. The line includes G-E White rigid conduit, boxes and fittings, building wire, BX, BraidX, switches including the new Sphinx Mercury Switch, convenience outlets, lamp holders, circuit breakers and fuses.**

**For further information about G-E Wiring Materials, see the nearest G-E Merchandise Distributor or write to Section CDW-8214, Appliance and Merchandise Deparment, General Electric Company, Bridgeport, Connecticut.**

HOMEBUILDERS
Don't build an obsolete home! Get your copy of folder describing the "10 POINTS" —from Architecture to Electrification — that should be considered when building or modernizing a home. The folder also explains interesting HOME-BUILDING CONTEST—costs you nothing, offers substantial cash awards! Write General Electric Home Bureau, Division 8214, 570 Lexington Ave., New York, N. Y. Be sure to give the name of your Electric Service Co.

*G-E Radial Wiring System

**GENERAL ELECTRIC**

ASSURE GREATER CONTINUITY OF SERVICE WITH JAMES R. KEARNEY Products

"Ten thousand of those trip outs in service and—not a single cartridge burn-out."

# Kearney Trip Outs Hold Down Costs

*Avoid improper functioning of your switches by using Kearney factory tested QUIK-ACTION FITALL FUSE LINKS.... Packed in handy cartons. Specify these positive performing links on your next order.*

## — and You Won't Be Troubled with Cartridge Burn-Outs on Low Capacity Faults . . . .

CARTRIDGE burn-outs were causing troublesome outages—unnecessary patrols were becoming a serious item in operating costs. . . . Then this company, like many others, decided to try Kearney Trip Outs—10,000 of them went into service the first year. . . . And not one cartridge burn-out among those 10,000 switches.... Today Kearney Trip Outs are specified as standard.

Careful research and sound engineering design account for the outstanding performance of these switches . . . point pressure contacts, coordination of moving parts, positive ejection of the fuse link after it has melted and separated —these are factors which Kearney engineers studied and perfected in the production of these Trip Outs.

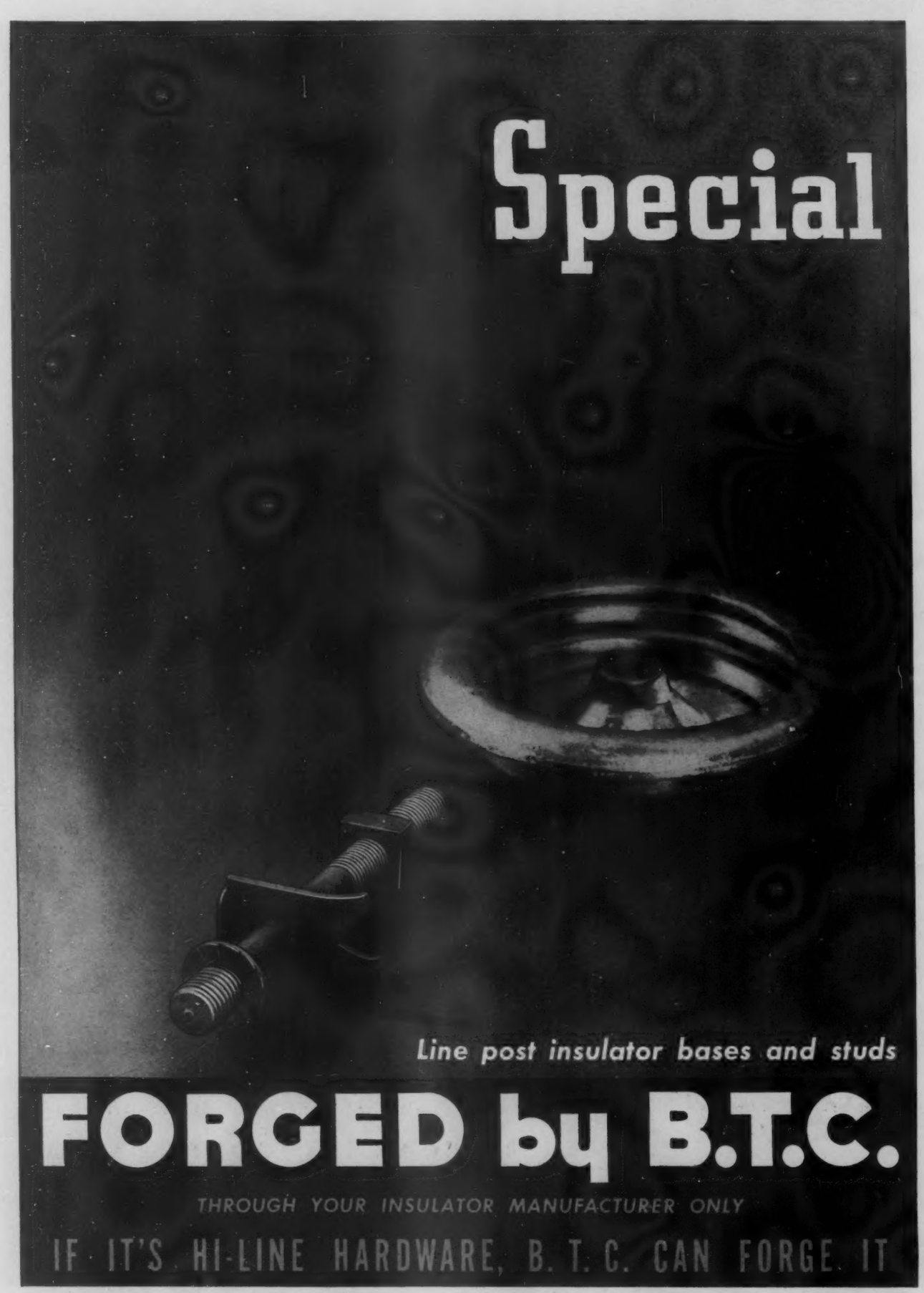
You can prove to your own satisfaction that Kearney Trip Outs are really exceptional—just test them any way you see fit.... Then you'll realize that you can hold down operating costs and eliminate a lot of troubles with cartridge burn-outs on low capacity faults by installing Kearney Trip Outs. . . . Speak to a Kearney representative, or write for details . . . today.

MANUFACTURED BY
JAMES R. KEARNEY CORPORATION
4224-42 CLAYTON AVE. SAINT LOUIS, MO.

*Exclusive Sales Representatives*

MAYDWELL & HARTZELL
INCORPORATED
LOS ANGELES • SAN FRANCISCO • PORTLAND

EXCLUSIVE DISTRIBUTORS
GRAYBAR ELECTRIC CO., Seattle, Portland, Tacoma, Spokane • WESTINGHOUSE ELECTRIC SUPPLY CO., Phoenix • J. R. BRADLEY CO., Reno

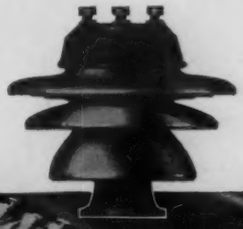

Special
Line post insulator bases and studs
FORGED by B.T.C.
THROUGH YOUR INSULATOR MANUFACTURER ONLY
IF IT'S HI-LINE HARDWARE, B. T. C. CAN FORGE IT

THE BREWER-TITCHENER CORPORATION, CORTLAND, NEW YORK

# FROM PANCAKE TO *Insulator*

Thousands of thin clay pancakes, created by batteries of huge filter-presses — that's an important step in manufacturing Westinghouse porcelain. These filter-presses squeeze out excess water from the "slip" bringing the clay to the exact consistency for proper processing. In the manufacture of fine porcelain these filter-presses deposit the solid ingredients on the filtering agents in thin cakes, which are then made into every conceivable sort of porcelain insulator.

This is only one of a long series of exacting processes performed by skilled craftsmen on precision machines to produce Westinghouse porcelain. So closely governed is each manufacturing step that Westinghouse porcelain may be depended upon to provide continuously satisfactory service far beyond normal requirements. When next you order porcelain, insist that it bear the familiar Westinghouse trade-mark of quality. More than 120 warehouses assure overnight service anywhere in the United States. Westinghouse Electric & Manufacturing Company, East Pittsburgh. Porcelain factories at Derry, Pa., and Emeryville, Calif.



J05018

# Westinghouse Porcelain

DO YOUR FUSE SERVICE CALLS COST LESS THAN

*51¢ Per Customer*

ON
TRIP
OFF
• Tamperproof—circuit cannot be restored against continuous overload or short circuit conditions.
• Rides through safe overloads preventing unnecessary service interruptions.
• Clears sustained overloads—trips instantly on short circuits.
• As simple to operate as a wall switch.

It's today's job and not tomorrow's — to reduce the cost of fuse replacement service. A check-up of Central Station Companies to find out what it costs to service fuse replacements revealed that an average of 51c per customer per year was not uncommon. The chances are that your costs are higher.

Every installation of Westinghouse Nofuze equipment reduces these service costs. And because it eliminates even short delays in restoring service, the customer is better satisfied.

Make the promotion of fuseless circuit protection today's job for today's profits. Send for the booklet, "There's One Born Every Minute," a story on fuseless protection that's right to the point. Ask your nearest Westinghouse office or wholesaler.

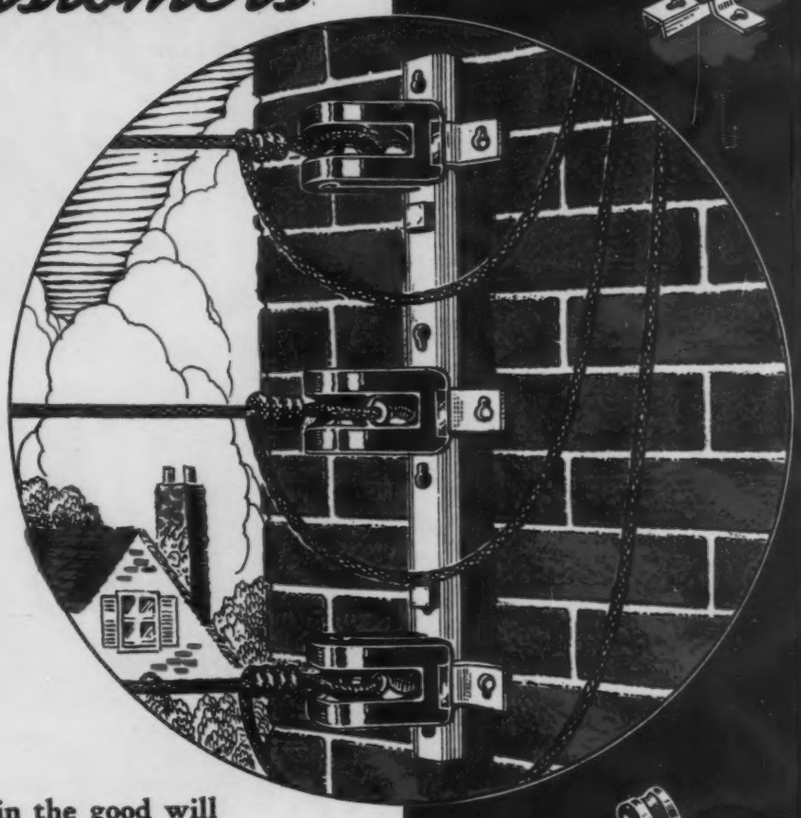
**WESTINGHOUSE ELECTRIC & MANUFACTURING CO.**
**EAST PITTSBURGH, PA.**

J-69211

**Westinghouse**

**NOFUZE MULTI-BREAKERS**

# *Locke wireholders mean satisfied customers*

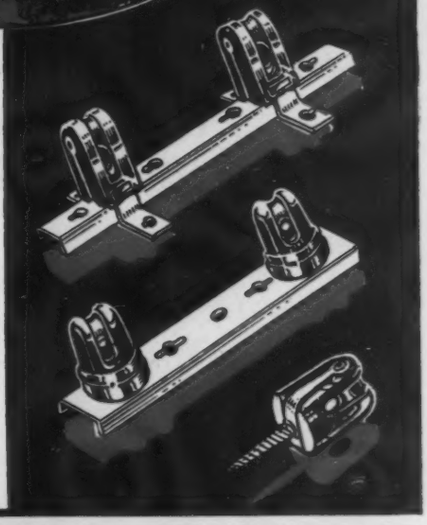


**A defective service bracket means more than the cost of replacement. It frequently means a dissatisfied customer and loss of revenue.**

**Locke Wireholders relieve you of this worry. They are strong, economical and dependable. The porcelain is rugged and held in compression at all times, giving higher mechanical safety factors.**

**They are made in popular sizes in single and multiple points. The latter have uniform spacings to simplify installation and enhance the general appearance.**

**Protect your revenue and retain the good will of your customers with Locke Wireholders.**



## LOCKE POLE LINE HARDWARE

*"better insulators & pole line hardware"*

**LOCKE INSULATOR CORPORATION**
Pole Line Hardware Division
**P. O. BOX 7827, SHARPSBURG STATION**
**PITTSBURGH PENNSYLVANIA**

*manufactured exclusively by*
Seyler
MANUFACTURING COMPANY
PITTSBURGH PENNSYLVANIA

# 12 hour water immersion tests
## GUARD THE PERFORMANCE
# of Roebling Rubber Insulated Wires

WE TAKE every possible precaution during manufacture to make certain that Roebling Rubber Insulated Building Wire will give long, trouble-free service.

Each reel or coil of wire is immersed in water for at least 12 hours, after which voltage is applied for the dielectric strength test... followed by the test for insulation resistance.

These are but a few of the many check tests performed in conjunction with manufacturing processes which insure the high quality of Roebling Rubber Insulated Wires and Cables.

*On-The-Dot-Delivery*

All our branches have ample stocks of Code grade and the commonly used sizes of 30% Performance Grade available for immediate delivery. Other types and grades for every purpose, including: — Intermediate Grade, 30% to 40% Performance Grade, 35% Heat Resistant Performite Grade in Solid or Stranded, Single or Multiple Conductor.

JOHN A. ROEBLING'S SONS CO.
OF CALIFORNIA

*Los Angeles Portland San Francisco Seattle*

**ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING**

# AFTER SAVING LIVES WITH LIGHT
# DETROIT ORDERS 850 MORE
# *Westinghouse Reflectolux*

Reflectolux Sr. Luminaires provide complete night driving safety on this Detroit thoroughfare because automobile drivers are able to see dangers ahead in time to avoid them. Test blocks on the street illustrate how hazards stand out for the driver in sharp silhouette in contrast to the surface brightness of the pavement beyond.

The Westinghouse Reflectolux Sr. that has proved so successful in reducing night fatalities in Detroit. This unit is designed for lamps up to 750 watts or 15,000 lumens.

Detroit's achievement in reducing night traffic fatalities has proved that increased visibility for the automobile driver is an absolute necessity. After a year's successful experience with newly-designed street lighting units that provide adequate visibility, Detroit now orders 850 more Westinghouse Reflectolux Sr. Luminaires for an expanded program of nighttime safety.

Detroit's street lighting modernization is based on one of the most thorough traffic surveys in the country. And wherever the new luminaires have been installed, the rate of night traffic deaths has been lowered. Detroit has adopted in Reflectolux a wholly new concept of light utilization that provides a sheen of brightness on the street surface so that pedestrians or other hazards stand out clearly in silhouette to the automobile driver.

The Westinghouse Reflectolux Luminaire provides night visibility conditions comparable with daylight. Reflectolux has a combination of new features — more light on the street surface — less glare — less maintenance — unexcelled flexibility and durability — that make it a leader in any campaign to save lives in night traffic.

For complete details on Reflectolux, ask your local Westinghouse Lighting Specialist for the new book, SAFETY WITH LIGHT; or address Westinghouse Electric & Manufacturing Co., Lighting Division, Edgewater Park, Cleveland, O.

WHEN YOU THINK OF *Lighting Equipment* THINK OF

**Westinghouse**

# COPPERWELD

*non-rusting*

## GROUND RODS and CLAMPS

*—for dependable grounds and dependable connections*

- COPPERWELD GROUND RODS are non-rusting. Their heavy layer of pure copper assures dependability and long life.
- Copperweld ground rods are rigid and easy to drive. The core of specially selected steel provides "stiffness" sufficient for driving in any soil.
- When a Copperweld ground rod is used with a copper ground wire the connection is copper to copper. No danger of harmful corrosion or increased rod-to-wire contact resistance.
- The top ends of all Copperweld ground rods are chamfered to reduce "mushrooming" during driving. Clamps may be slipped over the top of the rod after driving.

## DEPENDABLE COPPERWELD CLAMPS

*There are two types of Copperweld Ground Clamps:—*

The "Standard" clamp (cast body), illustrated at the left and the economical "Type B" (drawn body), illustrated at the right. Both types are available with either square head or safety set screws and both are made of high strength non-rusting bronze. They provide the simplest and most dependable means of making connections between ground rod and ground wire.

COPPERWELD STEEL COMPANY

Glassport, Pa.

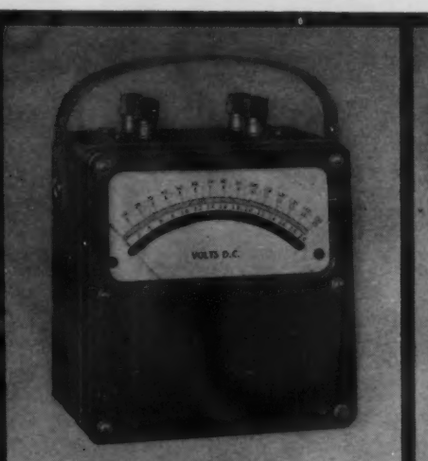
COPPER · BRONZE · COPPERWELD RODS, WIRE, AND STRAND

# Trustworthy

## . . . For Every Test Requirement

### MODEL 310 LINE

Precision portables (electrodynamometer type accurate within ¼ of 1%) for critical test work, available for AC and DC, in voltmeters (single, double and triple range), ammeters, milliammeters, wattmeters, etc. Scale length, 5¼ inches.



### MODEL 430 LINE

Rugged portables for maintenance work. A full line of *DC instruments* (Permanent Magnet Moving Coil type—accurate to ½ of 1%). *AC instruments* (Movable Iron Type—accurate to within ¾ of 1%). Also *wattmeters* for DC and AC (accurate within ½ of 1%). Scale length, 4 inches (approx.).

### MODEL 622 LINE

Single and multi-range *ultra-sensitive DC instruments* for measurement of minute currents in radio, telephony, thermocouple work, electro-chemistry, and the like. Shielded, double-pivoted instruments (Permanent Magnet Movable Coil type—accurate within ½ of 1%). Scale length, 6 inches.

For maintenance work, for industrial or school laboratories—wherever portable test instruments are employed—the name WESTON is recognized as a symbol of trustworthy electrical measurement.

WESTON "Portables" are designed in several types, with specifications and ranges to meet the particular requirements of all varieties of test work. Behind all the specifications, however, is the same "engineering-from-bedrock"—a consistent application of the design factors that make for rugged dependability as well as rated accuracy.

After all, when you buy a WESTON—whatever the type or specifications—you get an extra increment of experience which stems from a half-century of instrument building. Why not check with the WESTON representative as to the type of meter best suited to your needs?

Weston Electrical Instrument Corporation, 577 Frelinghuysen Avenue, Newark, New Jersey.

# WESTON *Instruments*

PACIFIC COAST REPRESENTATIVES

Eicher & Bratt,
263 Colman Bldg.
Seattle, Wash.

Herman E. Held,
420 Market St.
San Francisco, Calif.

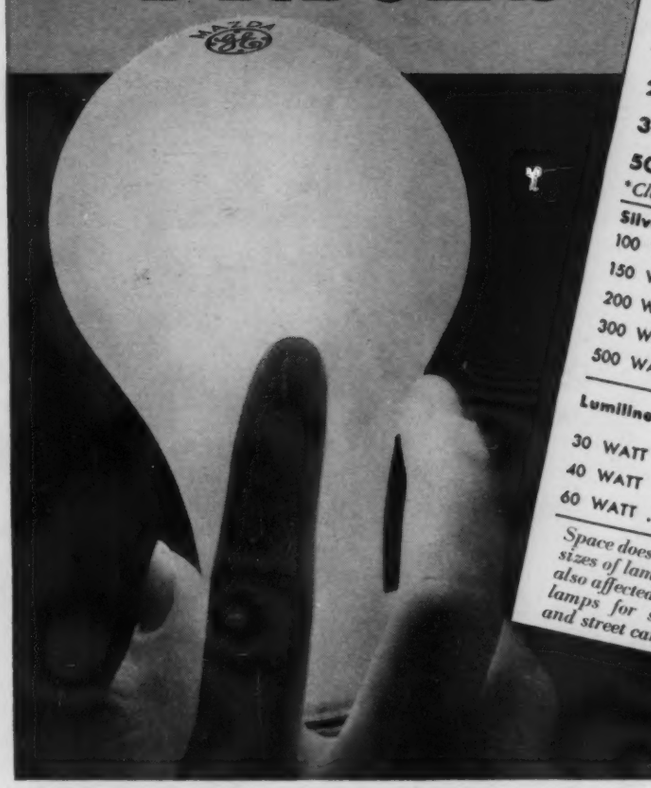
A. A. Barbera,
Subway Terminal Bldg.
Los Angeles, Calif.

The Jobs you READ about
Scene from the Metro-Goldwyn-Mayer Picture, "The Girl of the Golden West", starring Jeanette MacDonald and Nelson Eddy.
A FIVE STAR FEATURE!
★ ★ ★ ★ ★
JEANETTE MacDONALD . . . NELSON EDDY . . . and . .
TRIANGLE CONDUIT, WIRE AND CABLE
With production costs at thousands of dollars per hour . . . the power supply must be right! . . . so Triangle products are used exclusively on the wiring installation for M-G-M Studios.
TRIANGLE PRODUCTS REWARD BUYERS!
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding & Queens Blvds.
ELMHURST, NEW YORK CITY, N.Y.
PACIFIC COAST DIVISION
C. C. Hillis, Vice-President in Charge of Sales
390 Seventh St., San Francisco, California
NEXT ISSUE
TECHWOOD U.S. HOUSING PROJECT
ATLANTA, GA.
E.M.T. THIN WALL
CONDUIT INSTALLATION
ARTERIES FOR ELECTRICAL SYSTEMS INCORPORATED
It MUST be right!

GENERAL ELECTRIC ANNOUNCES

# *Brighter MAZDA lamps*

# NEW LOW PRICES



## SIGHT SAVING SIZES REDUCED AS MUCH AS 25%

*The 19th Major Price Cut in 17 Years*
*Effective April 1st, 1938*

| SIZE | WAS | NOW |
|---|---|---|
| 75 WATT | ~~20¢~~ | 15¢ |
| 100 WATT | ~~20¢~~ | 15¢ |
| 150 WATT | ~~25¢~~ | 20¢ |
| 50-100-150 WATT | ~~50¢~~ | 45¢ |
| 100-200-300 WATT | ~~65¢~~ | 60¢ |
| 200 WATT | ~~35¢~~ | 30¢ |
| 300 WATT* | ~~60¢~~ | 50¢ |
| 500 WATT (Clear) | ~~$1.40~~ | $1.20 |
| **Clear, medium base.* | | |
| **Silvered Bowl Lamps** | | |
| 100 WATT | ~~60¢~~ | 55¢ |
| 150 WATT | ~~70¢~~ | 65¢ |
| 200 WATT | ~~95¢~~ | 85¢ |
| 300 WATT | ~~$1.45~~ | $1.35 |
| 500 WATT | ~~$2.25~~ | $2.05 |
| **Lumiline Lamps** *(Prices cover inside frost and colors. Clear lamps 10¢ less.)* | | |
| 30 WATT | ~~$1.05~~ | $1.00 |
| 40 WATT | ~~95¢~~ | 90¢ |
| 60 WATT | ~~$1.05~~ | $1.00 |

*Space does not permit the listing of all the types and sizes of lamps made by G-E. Many other lamps are also affected by this latest price reduction, including lamps for streets, highways, trains, locomotives, and street cars.*

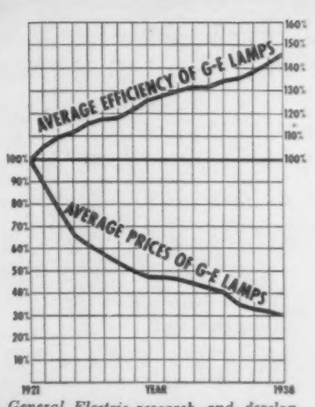
*"They stay brighter longer!"*

## *Better light for more people at lower and lower cost*

April 1st General Electric announces a double saving for everyone who wants better light for better sight: *First*, new brighter MAZDA lamps that *stay brighter longer* and give more light than ever before. *Second*, General Electric's 19th major price reduction in 17 years. New low prices on sight-saving sizes for homes, stores, offices, factories, commerce, and transportation.

This two-way benefit marks the latest step in General Electric's 60-year program of research and development . . . a program that is helping to make better light available to more and more people every year at lower and lower cost.

Utilities will recognize this double announcement as an opportunity to help their customers enjoy more and more of the benefits of light conditioning. General Electric Company, Nela Park, Cleveland, Ohio.



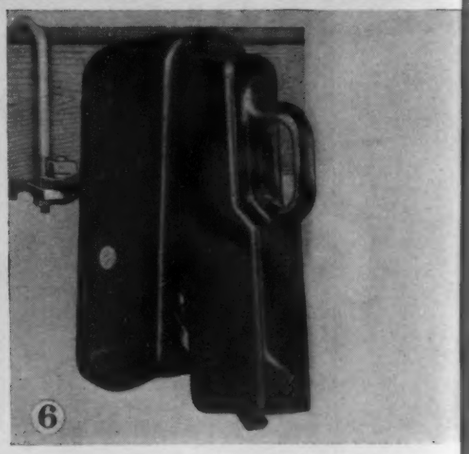

*General Electric research and development are constantly at work to increase the light output of* MAZDA *lamps and to reduce prices. The above chart shows graphically what has been accomplished since 1921. Average bulb prices are down 70% . . . while average efficiency has climbed 46% in the same short time.*

GENERAL ELECTRIC

# "THE DOOR DOES IT"

## *for* Larry the Lineman

G-E
RECLOSING FUSE
CUTOUTS
SAVE LARRY
THE LINEMAN
MANY
TRIPS




GENERAL ELECTRIC'S reclosing fuse cutout—with the reclosing feature entirely in the door—is improving service and cutting maintenance on branch circuits of many power companies. Because of the low first cost, this cutout can be installed profitably on circuits where a reclosing device has not previously been justified.

Experience has shown that, as more than 50 per cent of all faults are of a nature that will cause only one fuse to blow, this reclosing cutout will eliminate many special trips by the service truck.

### CONVERT YOUR STANDARD CUTOUTS

Because the reclosing feature is entirely in the door, you can convert any G-E 50-amp enclosed indicating and drop-out fuse cutout now in service—simply by removing the present door and putting on the new reclosing door.

Ask your G-E representative for complete information, or write for Bulletin GEA-2707. Address General Electric, Schenectady, N. Y.

**THIS IS THE DOOR that does it for Larry. It contains the reclosing feature—two fuses so arranged that the second one is automatically connected in the circuit one second after the first one blows.**

**Note the compactness of the G-E reclosing fuse cutout; it requires no more mounting space than a standard indicating and drop-out fuse cutout. Available in 50-amp ratings at 5000 volts and 7500/12,500 gr-Y volts.**

# GENERAL ELECTRIC

Filing No. 5254

340-38

ELECTRICAL WEST
April, 1938
Vol. 80, No. 4



# ELECTRA'S HUSBAND

## *The Rotary Engine Comes to Life*

THE BLAKE'S BABY arrived this morning, Electra greeted me with visible excitement. "It's a girl. But you can't guess what they are going to name her. Marylynne Rosalye Can you imagine anything worse?"

"Sure," I answered. "There's a charming woman in one of our Northwest cities known to her friends as Rota. There isn't one of them who could tell you her full name. It seems her father was a prominent attorney who became interested in the utility business at its very inception. He was a director of one of the first companies. Such was his enthusiasm for the electrical industry and its future that when his daughter was born he named her for one of the then absolutely new electrical devices."

"What did he call her?" Electra interrupted.

"Rotary Engine."

"Name of a name, what's that and why did he ever launch her into life with such an unholy appellation?"

"Rotary engine was the only thing the engineers could think of by which to describe the electric motor. Perhaps her father foresaw that this little machine would revolutionize our way of living. At any rate that's what he called her."

"Rota isn't so bad," Electra mused. "Suppose her father had been a chemist and had named her Carbon Monoxide."

THESE next remarks are addressed to married men only (or their wives). In addition to drinking their whiskey and soda without ice and abhorring draughts, the British have peculiar ideas about personal comfort. From one of the British electrical journals we learn that electricity has solved the problem of cold feet. At the British Industries' Fair there was shown the "Thermega" electric foot muff. From the picture one judges that it consists of a double slipper built like those sheepskin-lined things wives give husbands at Christmas. Only like feminine "mules" it is decorated with a circlet of fur around the top. The foot muff is rated at 45 watts and a model is available which will operate from an automobile storage battery.

NOTE: One has been ordered for Electra. I expect to go to sleep in peace in the future and I also warn those hardy friends whose homes are often like the inside of an icebox that "Thermega" will accompany Electra on all future visits.

IF I WASN'T so cynical, I would have been flattered by a recent letter from the office of the Secretary of the Treasury. It was a subtle direct mail approach for the purchase of Baby Bonds. And it contained all the best direct mail appeals including a handsome batch of circulars with the usual order form. But there was a flaw in the address. It had my middle name in full. There are only two places where it might have been secured for Uncle Sam's mailing list—my war risk insurance or income tax blank. Not only do I resent this but somehow I feel let down.

LAST month we did a little speculating about the subject of adequate wiring, hoping to provoke some controversy. We did. Here are some more ideas that might be interjected under the general heading of "perhaps." Perhaps we should abandon Number 14 entirely and accept Number 12 as a minimum for permanent wiring. Perhaps our lamp bases are all wrong. Perhaps we can improve our method of fusing. Perhaps we should use tapered conductors. Perhaps the grounded neutral is not such a good idea after all. Perhaps we could find good use for rigid conduit in 3/8-inch and 5/8-inch sizes. Perhaps some new plastic should be substituted for porcelain. Perhaps the voltage of ordinary circuits should be raised to, say, 140.

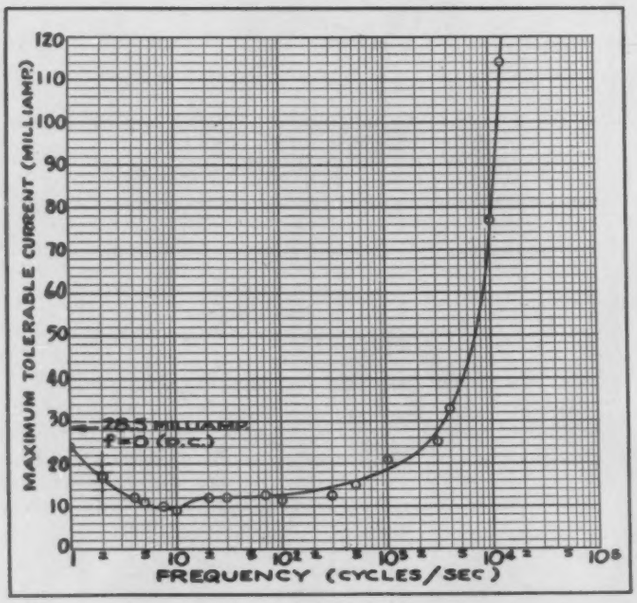
I don't know—I merely say "perhaps." But this much is certain—the right solution to the problem of adequate wiring will not be found until we clear the decks and start clean.

EVERY TIME there is a discussion at home involving electricity, Electra persists in having specific definitions for every one of the technical terms used. I mentioned this to one of our "electrifier" friends and he has presented an answer to one such bothersome question. "A lot of people would like to know what a kilowatt is," he writes. "Well here is the answer: It's a whistling post a mile from the San Joaquin Light & Power steam plant near Buttonwillow. That ought to satisfy everyone, including your esteemed better half, Electra." For proof he submits the accompanying photograph.

Mention of this to one of our friends with an investigating mind has served to clear up many puzzling points about electricity. If one wants to learn about things electrical, he can call in a railway passenger agent and fix up a tour which would take him to such places as Ampere, N. J.; Watts, Ark., Calif., Okla.; Volt, Mont.; Thermal, Calif.; Electra, Fla., Tex.; Light, Ariz., Ark., Va.; Meter, Va., Revolution, N. C.; Voltage, Ore.; or Magnet, Ark., Ind., Neb., Tex.

If his education is not sufficiently complete by then, he could continue on to Electron, Wash.; Field, Mo.; Energy, Ill.; Kan., Tex.; Power, Mont., W. Va.; Cycle, N. C.; Service, Ala.; Suspension, Ala.; Cable, O., Wis.; or Load, Ky.

Unfortunately, this list, I learned, was prepared from a 1926 Postal Guide. Mr. Farley's latest book would probably show a much greater variety and geographical diversity. Uncle Sam has gone into the power business in a big way since we took a new lease on life.




# Danger of Electric Shock

By CHARLES F. DALZIEL*
Department of Electrical Engineering,
University of California, Berkeley

DANGER of electric shock was recognized early in the formative stages of the electrical industry, and experiments on the effect of electric shock, particularly on animals, are recorded in literature as early as the 18th century.

So great has been the concern regarding the safety of electrical apparatus, especially for use in the home, that all home appliances, wiring materials and even the installation must be approved by both city inspectors and special laboratories in the serious attempt to protect the public against faulty workmanship and unsafe products. In spite of these precautions, the present yearly toll of electrical accidents in the United States is approximately 1 per 100,000. Between 100 and 200 fatal accidents occur on house circuits and appliances annually, and fatalities on lower voltage circuits are not uncommon.[1]

The prospect for an early reduction in electrical accidents is not very promising largely because of the recent expansion of electric service in rural areas where proper inspection and enforcement of safety regulations is difficult, and also because of several proposed applications which many engineers consider unsafe.

### Dangerous New Devices

Recently there have appeared several new devices designed to control insects and animals by electrocution or a less severe electric shock. These devices, such as the electric fence, fly panel and insect trap, have exposed electrodes and therefore may create hazards to both animals and humans. Unfortunately, many of these devices have been constructed and installed by novices, and already several serious accidents have occurred.[2-3] The perfection of these devices is now being investigated, and it is possible that approved types will be offered to the public in the near future. Under no circumstances should an unauthorized individual undertake to construct his own.

Obviously, direct experiment of severe electric shock on man is out of the question. Determination of the probable currents passed through the body of an accidental victim is difficult because of the large variability in the contact resistances. The resistance of dry skin may be as high as 100,000 ohms per square centimeter. Skin wet with salt water or perspiration may have a resistance of only 1/100 this value. Under prolonged shock or high voltage the skin may puncture and the protection originally afforded by the relatively high skin resistance may be lost. There remains the ohmic resistance of the body, but this is relatively small, and may be taken as approximately 200 ohms.[2-4-5]

The voltage received during accidental shock may control the violent muscular reactions at the instant of contact, and accidents on high voltage circuits often tend to throw or knock the victim clear. However, there is ample evidence that current and not voltage is the determining factor controlling damage to the body. In the past the fatal currents have often been calculated, using Ohm's Law, $I = E/R$,[2-6] from the known circuit voltage, and the contact resistance estimated from the apparent condition of the skin of the victim. Actually the current may have been much larger as the result of partial or complete electrical failure of the skin. Because of the possibility of skin breakdown, the writer believes that the contact resistance should be neglected in computing the probable maximum accidental current unless there is evidence to the contrary.

The tongue is very sensitive to electric shock and one can "taste" very small electric currents. The brain appears to be easily injured by the passage of electric currents and very small currents applied directly to the heart may produce ventricular fibrillation. It is apparent that the current pathway is of great importance. In many industrial accidents the current pathway is between the hands, or between a hand and the feet.[7]

### Shock's Effect on Man

There appears to be good agreement between authorities regarding the smallest electric currents that can be perceived by grasping electrodes in the two hands. The threshold of perception for 50 and 60 cycle current is about 1 milliamp.[8]

As the current is gradually increased muscular contractions increase in severity and finally a point is reached where a person is unable to release his grasp on electrodes held in the hands. In accidental electric shock a victim can often release himself by using muscles little affected by the current. In other cases muscular contraction may tend to break the contact rather than to improve it. However, it can easily be demonstrated that muscular reactions accompanying a severe electric shock would not tend to assist a victim in freeing himself from a firm grip once established on a small wire, and it is the writer's opinion that the current causing involuntary muscular control should be regarded as the maximum current to which man should be subjected. Unfortunately there exists considerable disagreement between authorities regarding the limit of the threshold of voluntary muscular control. In an effort to determine the limit of voluntary muscular control, or simply the let-go current, experiments were recently conducted at the University of California.

Past experience and the nervous or mental state of the subject are very im-

* From a report presented before the Tenth Annual Rural Electric Conference, Davis, Calif., Jan. 12, 1938.

portant factors which must be considered in conducting experiments of this type. In order to increase confidence and reduce detrimental psychological factors the maximum tolerable current was determined first. The subjects placed their hands or one hand and a foot on two flat metal discs. A potentiometer rheostat, energized from a 110-volt, 60-cycle source was varied until the subject was satisfied that he could withstand no greater sensation.

### Enough's Enough

In every case the subject interrupted the circuit of his own accord by raising his hand from the electrodes. Since the subjects were required to carry on a conversation during the test, there was no evidence in any case that breathing or speaking had been impaired. The average maximum current between hands of 81 recorded tests on 56 men was 13.9 milliamp. The maximum current was 22 milliamp. The average current between hand and one foot of 18 tests on 15 men was 13.5 milliamp.

In determining the let-go current, the subjects placed one hand on the flat metal disc, and with the other grasped and released a No. 10-gage copper wire. The average maximum current of 55 tests on 42 men was 12.6 milliamp, and one subject released 18 milliamp. In these tests right-handed persons grasped the wire with the right hand and conversely. In all cases tried, the other hand had approximately ½-milliamp. lower limit. It was noted that the best physical specimens had higher limits than those less hardy. The men were between 20 and 40 years of age. There appeared to be no marked difference between wet and dry hands, experiments having been made with skin wet from perspiration, water, salt and weak acid solutions.

It should be recorded that some commentators thought the lowest values should be taken as the limit for the threshold. The writer believes that the average value should be entirely satisfactory for the group tested, since it was impossible to know whether the recorded values were the true physiological limits, or modified by fear, lack of interest or determination. In most cases subsequent trials raised previous values. It was noted that slightly smaller values were obtained when smaller electrodes were used, indicating that the type of contact plays an important part since it controls the current density in the muscles and nerve endings adjacent to the point of contact. Similar tests using high reactance sign-lighting transformers with open circuit voltages up to 9,720 volts gave substantially the same results. From these tests it was concluded that the limit of the threshold of muscular control for 60 cycle current was about 12½ milliamp.

It may be of interest to note the effect of frequency on the maximum tolerable current. The cut shows the curve obtained on the writer.

Values for frequencies below 60 cycles were obtained from an alternator driven at low speeds. High frequency values were obtained by amplifying the output of a vacuum tube oscillator. Because of the good agreement of all values at 60 cycles, it was assumed that average data of the group would have given a similar response. It is probable that the let-go current curve would be similar also.

Currents in excess of the limit of voluntary muscular control are dangerous since the current pathway through the body might affect the respiratory muscles and stop breathing during the shock. No serious or permanent after-effects are likely to develop merely from cessation of normal breathing, provided the shock does not last too long. Normal breathing usually occurs spontaneously upon breaking the circuit. Currents greater than those producing temporary paralysis of the respiratory muscles may affect the respiratory nerves and produce respiratory inhibitions which may last for extended periods. The time element is a matter of minutes rather than seconds, and there may be time to effect a rescue. In many cases natural respiration may be stimulated and the victim saved by prompt application of the Schaeffer prone pressure method of artificial respiration.

### Effect of Greater Currents

Somewhat greater currents affecting the skeletal muscles may produce nearly instant death by abnormal stimulation of the heart. Death under these conditions is believed to result from excessive stimulation rather than from actual damage of the heart tissues or muscles, and is due to ventricular fibrillation. In the fibrillating condition the heart ceases its normal rhythmic motion and seems to quiver rather than to beat. The pumping action ceases and no heart sounds can be heard with a stethoscope. Failure of blood circulation results in asphyxial death within a very short time. It is believed that once ventricular fibrillation occurs in man it is not likely to cease naturally before death. The *minimum* current required to cause fibrillation for a pathway between the hands or between the hand and one foot has been stated to be 100 milliamp. for 60 cycle currents, and about 5 times this value for direct current.[8] These values were obtained from exhaustive experiments on animals of comparable heart and body weights to man, and are consistent with the few recorded human fatalities available.[6]

These carefully conducted experiments on animals indicate that the susceptibility of the heart to fibrillation varies with the shock duration, current and the phase of the cardiac cycle at the instant of shock. For shocks less than about 0.10 sec. duration the fibrillating current may be ten times that required for shock durations of 1 sec. or more. The hearts of sheep seem to be most susceptible to currents of about 6 amp., and less sensitive as the current is increased to about 25 amp., the limit of the test equipment.[8] It is believed that strong muscular contractions accompanying the very high currents hold the heart steady and prevent fibrillation.[7] This may explain certain puzzling industrial accidents in which victims apparently withstood relatively large currents.

### Sheep and Success

The experiments on animals show that repeated shocks are not cumulative in their effect on the heart, and the heart generally responds to normal in about five minutes if fibrillation does not occur. Experiments by several independent investigators in which animals were given severe counter shocks to arrest fibrillation have met with considerable success.[8] Many sheep have been observed for months after recovery with no evidence of abnormalities, and many have borne normal offspring. However, the use of counter shock in the treatment of ventricular fibrillation is still in the early laboratory stages and should never be attempted.

Investigations at higher currents are considered of minor importance, since high currents are liable to cause severe burns and much local damage to the tissues unless the contacts are good and the shock of short duration. It is likely the victim would be maimed should he survive, since such currents may cause permanent damage to the nervous system and permanent disability of the affected members.

---

[1] Electrical Accidents, W. B. Kouwenhoven, *Electrical Engineering*, Vol. 56, N. 9, pp. 1077, 1937.

[2a] Electric Fences Save Money but Increase Deaths, F. A. Short, ELECTRICAL WEST, Vol. 79, No. 6, pp 46, 1937.

[2b] Electrocution from Electric Fence, W. R. Volheye, *News-Bulletin*, I.A.E.I., pp 36, January 1938.

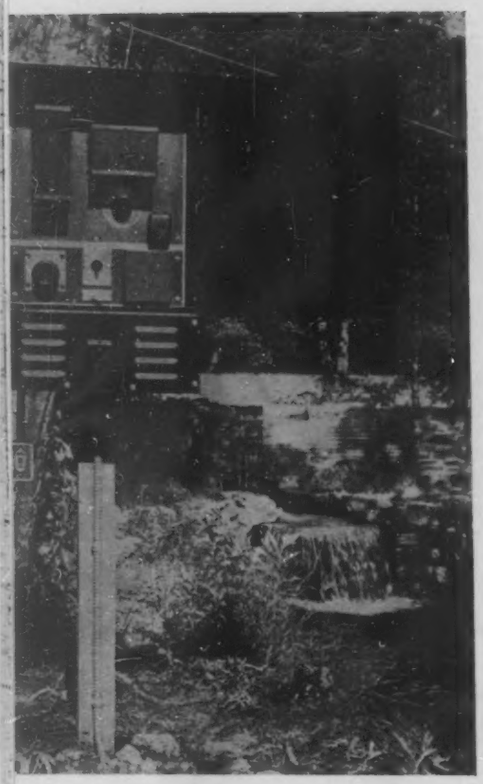
[3] Problems in the Design of Electric Fence Controllers, H. W. Riley, presented before the American Society of Agricultural Engineers, Chicago, Dec. 1, 1937.

[4] Effect of Electric Shock, W. B. Kouwenhoven and O. R. Langworthy, *Electrical Engineering*, Vol. 49, No. 1, pp 381, 1930.

[5] Effect of Electric Shock on the Heart, L. P. Ferris, B. G. King, P. W. Spence and H. B. Williams, *Electrical Engineering*, Vol. 55, No. 5, pp 498, 1936.

[6] Discussion of the Effect of Electric Shock on the Heart, *Electrical Engineering*, Vol. 55, No. 11, pp 1263, 1936.

[7] Electric Shock Interpretation of Field Notes, W. Maclachan, Jr., *Industrial Hygiene*, Vol. 12, pp 291, 1930.



Actual installation views of Burkey's electric fish screen. Immediately above—The water-proof, fire-proof control box. Top left—Water in the conduit is at full height; note angle of electrodes swinging with movement of the water. Top center —A school of trout warily circles the edge of the electrified zone, but not one has attempted to cross into the zone. Top right—Front view of the screen with electrodes hanging free, thus permitting free flow of water and debris

STATE administrators and commissioners in charge of fish life management are today constantly confronted with the problem of providing an adequate supply of fish for the insatiable angler. This means, in most cases, artificial as well as natural propagation. And this, in turn, means the expenditure of a large amount of money.

Operating private and commercial fish hatcheries to meet the demand is the largest item. But another item is steadily advancing to the fore: After the fish are planted in lakes and streams a screening program is necessary to prevent losses of fish passing into irrigation ditches, small or large diversions, power flumes, etc.

Thus, screening of open diversions to prevent loss of fish life is today a major need in almost all sections of the United States.

A check by various state fish administrators of losses resulting from unscreened diversions has revealed that in some instances total plantings are exceeded by the combined losses of fish stranded on irrigated fields or destroyed in flumes. In other words, except for the benefits derived from the natural propagation of a planting before destruction, the bulk of the cost of fish hatchery operation has been almost completely wasted.

This does not sit well with the administrators' new realization that it is better to halt, or at least slow down, hatchery production and install fish screens than to divert money to a fish production which never makes headway.

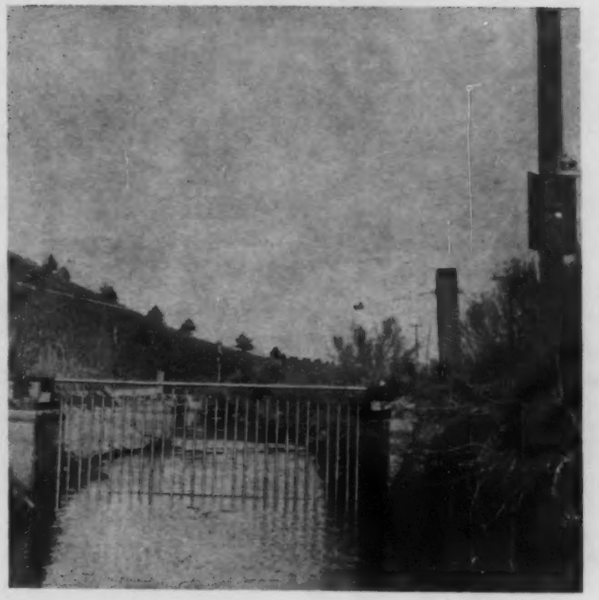
A survey of fish screens generally reveals limited mechanical improvements during the past two decades. Screens have been unpopular with farmers for a variety of reasons: They obstructed the free flow of water; they were often clogged by debris; maintenance and installation costs were heavy; design and operation was impractical, and, in many cases, the necessity for concrete constructions meant the building of coffer dams which delayed field work and boosted the cost still more.

With electric screens there was also another problem. This involved the question of what happens when two fish of different size encounter some electrodes placed in the water and charged by commercial lighting current.

Obviously the use of fixed voltages at a commercial frequency will affect or even divert one fish, but will be either too weak or too strong for the other. This wasn't so good—especially since nature rarely cooperates to the extent of furnishing fish of uniform size. Hence the employment of this kind of screen was impractical. The answer had to be a system whereby all sizes of fish would be affected without injury to any particular size.

That answer seems to have been found. It is the invention by H. T. Burkey of an electric fish screen which may, in fact, revolutionize the nation's fish breeding program. The device boasts four attributes; simplicity of operation, elimination of concrete construction, low operation and maintenance costs and, above all, provision for the free flow of water.

In developing his screen, Burkey put in years of study on the effect of electric screens on fish. During that time he discovered a number of things, each one leading naturally to the other.



# An Answer to *Fish Screening*

By J. O. CASE
President, Quality Electric Co.,
Los Angeles

He found that when fish were subjected to ordinary commercial frequencies and voltages they developed a rigidity of the muscles known as physiological tetanus. He found that fish reacted to certain electrical impulses which caused very unpleasant stimuli in their neuronic systems but did not cause tetanus or otherwise injure them. And he found that if the water was electrified with a graduated zone and by a series of electric impulses at relatively low frequency, the zone was just as effective in stopping fish as the old methods had been in killing them.

These findings were the frame-work on which the screen, recently patented, and now being manufactured under a license agreement between Burkey and General Electric Co., was developed. When the device was put into actual operation in an irrigation ditch where fish of various sizes and species entered the electrified zone it was found that the fish retained free use of their muscles and were therefore able to swim into neutral waters.

In developing the screen, however, Burkey had various mechanical troubles. Put into early use in operating the screen was a motor-driven apparatus which worked quite effectively but which was finally discarded because it required constant attention and because it was found to be impractical for continuous operation. It was one thing to develop a suitable wave form which would successfully divert all fish, but quite a different matter to apply this special type of current to the screen in isolated locations That involved the breaking of comparatively heavy currents over long periods of time without the benefit of trained technicians to keep such equipment in efficient operation.

Other methods of operation were also tried and discarded for similar reasons.

Then the industrial vacuum tube made its appearance, and to it Burkey turned. Here was a device which could handle current, yet had the distinct advantage of operating without sparking or contact troubles. There were no moving parts and therefore nothing to wear out.

With the aid of General Electric, a circuit was devised which utilized an industrial vacuum tube known as a Grid-Glow or Thyratron tube. Ruggedly built, the tube commonly operates without interruption for two years (though replacement is recommended at more frequent intervals). As adapted to the fish screen, it employs a self-timing feature and generates a wave form suitable to the job of diverting fish.

Because of the characteristics of this wave form, very little wattage is consumed. Quite often less than 100 watts of electrical energy are required for small installations. This feature makes the operating cost of the screen practical even in larger diversions which formerly required very heavy current drains when commercial frequencies were used. The electronic impulse generator has cut down the current consumption of the electric screen about 80 per cent.

Other improvements over old-style electric screens include the placement of electrodes, which creates the desired graduated zone, and construction advantages making the electrodes flexible enough to swing freely with the passage of debris.

Numerous states have taken steps to enact legislation permitting fish and game administrators to proceed on a sound method of fish screening. The California legislature passed a fish screening bill in 1937. This places the construction and maintenance of fish screens jointly upon the sportsmen who buy licenses and the diverter of water and also gives the Fish and Game Commission the power to order the installation of screens.

Further provisions written into the bill by farmers and other large users of water stress certain points that Burkey's screen seems made to fill. The law reads in part: "Any screen installed shall be such as will be reasonably adequate to prevent fish from passing into the conduit and such as will not unnecessarily impede the flow of water or prevent the owner from diverting the amount of water he is legally entitled to divert. The type, size, mesh and location of the screen and the time within which the screen shall be installed shall be mutually agreed upon by the commission and the owner of the conduit. In the event the commission and the owner of the conduit cannot agree upon the type, size, mesh and location of the screen . . . such matters shall be submitted to the Chief of the Division of Water Resources of the State of California whose decision thereon shall be final and conclusive."

California wildlife conservation groups supported the bill; the Fish and Game Commission earmarked more than $200,000 for fish screen construction during the next two years. So, if Burkey's screen can be sold to the commission, California anglers at least stand to save enough money to restock state waters on a still larger scale.

And if California can do this, other states can and will do it also.

# Saving Distribution Transformers

## *From Overloads and Short Circuits*

By GEORGE W. WESTCOTT
Utah Power & Light Co.

STANDARD for many years has been the use of cutouts for protecting distribution transformers from overloads and short circuits.

A survey of companies in the Northwest group reveals that the primary cutout is still the dominant means of protection against such faults although three companies report they are experimenting with the omission of the primary cutouts and the substitution of secondary cutouts for the protection of transformers on rural extensions. In all cases the transformers are in the 6,600-volt or higher class and of 10 kva. or smaller capacity.

**NORTHWEST ASSOCIATION REPORT**

To be presented at the 1938 meeting of the **Transmission & Distribution Committee**, E. F. Pearson, chairman, Engineering & Operation Section, Northwest Electric Light & Power Assn.

Four companies report the limited use and satisfactory service of the completely self-protecting transformer. These are in use on 2,300-volt and higher-voltage circuits. One company states that in some of the earlier 3-kva. transformers of this type, some difficulty was experienced due to the low setting of the secondary breaker, resulting in the breaker opening before the blowing of the customers' 60-amp. fuse. This has been corrected in the modern transformer.

To determine the relative importance of protecting transformers from overload and short circuit, I have classified (Table I) the outages reported by a group of nineteen utilities for the year 1936. Reference to this tabulation shows that outages from overloads and short circuits were 41.2 per cent of the outages from all causes in the 2,300 to 4,000-volt range and 19.2 per cent at 6,600 and higher voltages. It is expected that the importance of protection for overloads and short circuits in this latter voltage class will approach that shown for 2,300 to 4,000-volt transformers, as the number of outages from lighting decreases due to the greater interconnection of primary and secondary neutrals.

Outages classed as miscellaneous and unknown constitute a large percentage of the total. It is probable that a large number of these would be classed as secondary faults if their exact nature could be correctly determined.

Those advocating the use of secondary fuses have advanced two reasons for their adoption: (a) greater protection for small transformers in the higher voltage class and (b) decreased cost of initial installation.

Single-phase transformers of 5-kva. and smaller in the 6,600, 11,000 and 13,200-volt class have a full load current varying from ¼ to ¾ amp. Adequate primary fusing for such small currents necessitates the selection of a very small fuse. These small fuses have given trouble due to corona discharge and low mechanical strength. It is therefore customary to use a primary fuse several sizes larger than requirements dictate.

A large part of our recent rural lines have been extended for long distances into sparsely populated areas, and to reduce costs have been constructed with relatively small, high-strength conductors, thereby giving a circuit of high impedance which limits the current that can flow under short circuit conditions. Often this current is insufficient to blow the smallest practical size primary fuse and consequently the transformer continues to operate under heavy overload until it is destroyed through overheating. For these reasons it is thought that small transformers on the higher-voltage circuits can be better protected by fusing on the secondary side.

Reduction in cost is always of vital importance to the industry, particularly in the service of rural customers. It is estimated that a 6,900-volt primary fuse, installed, costs approximately $11 while the installed cost of a secondary fuse is in the neighborhood of $2.50. Therefore on a 6,900-volt, single-phase grounded-neutral system, primary fuse protection costs $11 while secondary fuse protection costs $2.50 for a two-wire secondary and $5 for a three-wire secondary, or 23 per cent and 45 per cent respectively of the cost of primary protection. It costs roughly $130 to provide and install a 3-kva. 6,900-volt transformer, primary fuse, two-wire service and meter for a rural customer. Substitution of secondary fuses reduces the cost to serve this customer 6.5 per cent.

Only three companies reported having used secondary fuses, none reported any experience with secondary breakers except where these were a part of completely sellf-protecting transformers as mentioned.

One company reports that it has 35 transformers protected through fusing the primary branch line only and installing fuses on each transformer secondary. It has also 50 transformers fused on both the primary and secondary side of the transformer. Under its present procedure, when additional transformers are installed on existing branch primary lines, the primary fuses are moved to a location where the branch taps the main line, and secondary fuses are placed in the transformer secondary. This company states that it still considers this practice experimental although its experience, averaging over one year, has been very satisfactory.

The second company says that about two years ago it made two 6,900-volt branch-line extensions having four or five transformers on each line and fused the hot legs only of the secondary with 30-amp. plug cutouts fused with copper wire. Primary fuse cutouts were installed to protect each branch line. No trouble has been experienced with this installation and it is now proposed to use a similar arrangement for an 11-kv. extension with seven transformers except that manufacturer's secondary fuse cutouts will be substituted for the plug cutouts previously used.

The third company recently has in-

Table I—Classification of Causes of Transformer Outages

| Cause of Outage | 2300/4000 Volt Class Number of Outages | 2300/4000 Volt Class Per Cent of Total Outages | 6600 Volt and Higher Voltages Number of Outages | 6600 Volt and Higher Voltages Per Cent of Total Outages |
|---|---|---|---|---|
| Lightning | 2,101 | 26.0 | 1,398 | 49.7 |
| Overload and secondary short circuits | 3,324 | 41.2 | 539 | 19.2 |
| Miscellaneous and unknown | 2,646 | 32.8 | 878 | 31.1 |
| Total | 8,071 | 100.0 | 2,815 | 100.0 |

stalled ten transformers on a 6,900-volt extension using a primary fuse to protect each branch line and secondary fuses for each transformer, but the installation has not been in service long enough to judge its merits.

**Eastern Experience**

Realizing that the use of secondary fuses and secondary breakers had received earlier attention and had progressed to a greater degree in other sections of the United States, two companies not in the Northwest Group were asked for a brief report of their experience. Company A has concentrated on the use of secondary breakers while Company B is a pioneer in the use of the secondary fuse.

Company A, operating in the South Central Section of the United States, has used secondary breakers for a period of 2½ years, having approximately 900 transformers protected in this manner. Of these, 100 are of the G.E. type AF-1 and the balance are breakers internally mounted in G.E. type HB transformers and Westinghouse type C.S.P. transformers. The purchase of externally mounted breakers has now been discontinued as it is claimed that transformers with built-in breakers are more economical in first cost than the purchase of transformers plus external breakers. The internal mounted breakers also give closer coordination with transformer ratings.

The primary fuse is omitted when the secondary breaker is used although a primary fuse is, in most cases, installed at the junction with the main line. The record of transformer failures shows that there are fewer failures when secondary breakers are used than when only primary fuse cutouts are employed.

Company B, which operates in a southern state on the Atlantic seaboard, has been using secondary fuses for the last seven years, installing them on 6,900 and 11,000-volt transformers, 10-kva. and smaller, supplying single-phase loads. The primary fuse is not omitted when secondary fuses are installed on standard transformers but is omitted when used with farm-type transformers provided with internal fuses.*

Approximately 6,000 transformers are protected with secondary fuses. Fuses in use are Memco type "E", Line Material type BF-252 and a small number of G.E. type 9F-7A1. It is stated that the cost of a secondary fuse installation is 30 per cent that of a primary fuse installation for a 6,900-volt, single-phase, common-neutral system.

* Writer's note: These internal fuses are of high capacity intended to blow only under currents which would damage the transformer windings and therefore should not be considered as giving protection from overloads or short circuits external to the transformer.

# Pilot Wire Relay Protection

## *For Puget Sound - Seattle Tie Line*

By T. T. SMITH
Puget Sound Power & Light Co.

INTERCONNECTION between Puget Sound Power & Light Co. and the City of Seattle Lighting Department was completed in December 1937. This connection consists of a 55-kv. line, 4.5 mi. long, connecting the company's Canal substation to the City's North substation. At the North substation a bank of 3 10,000-kva., 55/26-kv., tap-changing-under-load transformers effect the connection from the company's 55-kv. system to the city's 26-kv. Since the line and transformer bank are considered as an operating unit, no 55-kv. oil circuit breaker is provided on the high-voltage side of the transformer bank, the line oil circuit breaker at Canal substation serving as both line and bank breaker.

In working out a system of relaying it was necessary to consider several conditions:

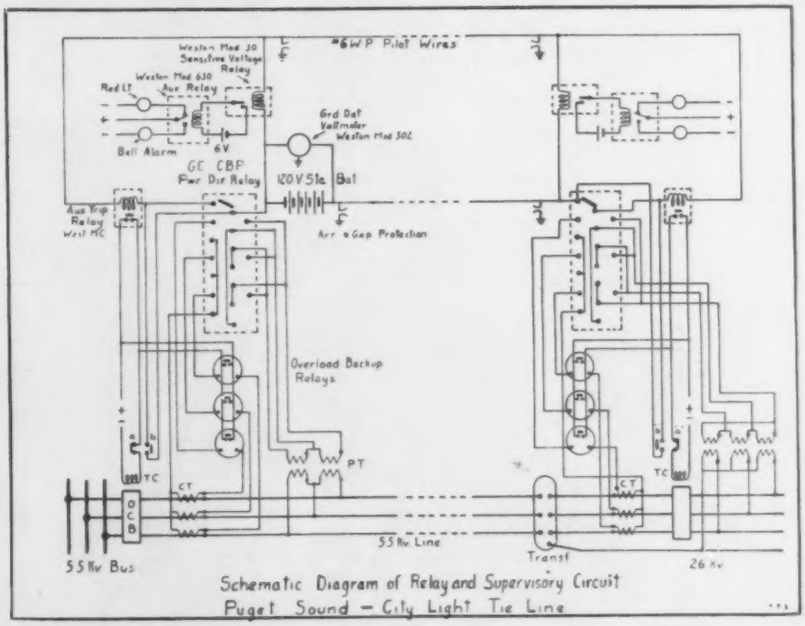
1. It should not in any way disturb the existing coordination of either system's relaying.
2. It should protect against line faults on the tie line and not reflect on either system.
3. It should not open the tie line in case of faults on either system.
4. It should provide transformer bank differential protection.

A pilot wire system was chosen to meet these requirements. The equipment selected consisted of two General Electric type-CBP, high-speed, three-phase power-directional relays with voltage restraint. One relay is used at each end of the line, the contacts being connected in series with each other by the two pilot wires. The pilot-wire circuit is energized from the ungrounded station control battery at the Canal end. Westinghouse tripping relays, type-MC, in series through the pilot-wire circuit, are installed at each substation.

**NORTHWEST ASSOCIATION REPORT**

To be presented at the 1938 meeting of the **Electrical Equipment Committee**, J. Hellenthal, chairman, Engineering & Operation Section, Northwest Electric Light & Power Assn.

The power-directional relay contacts close only when the power is flowing away from the bus over their respective lines and with a collapse of the voltage restraint. These conditions can only be fulfilled when a short circuit occurs on this line, in which case the oil circuit breakers at each end of the line open simultaneously. A fault in the transformer bank would be cleared the same




Schematic Diagram of Relay and Supervisory Circuit
Puget Sound – City Light Tie Line

as a line fault. To maintain the continuity of the pilot-wire circuit in case one breaker is faster than the other, the tripping circuit of the power-directional relays are paralleled through a "b" switch, on the oil circuit breaker, which closes when the breaker opens. The tripping relays must have coils to withstand continuous operation as would occur when both oil circuit breakers were open at the same time. Overload back-up relays are provided to trip the circuit breakers independent of the pilot-wire circuit.

The pilot wires consist of two No. 6 weatherproof copper conductors, strung on the secondary crossarms of an overhead distribution circuit. They are equipped with fuses, multi-gap arresters, and thyrite meter protectors at each end to protect apparatus from lightning or contact with high-voltage lines.

An alarm system composed of a Weston Model-630, sensitive, high-resistance voltage relay gives warning by ringing a bell if the pilot wires become either open or short circuited. A Weston ground-detector voltmeter is used to indicate a ground on these two wires.

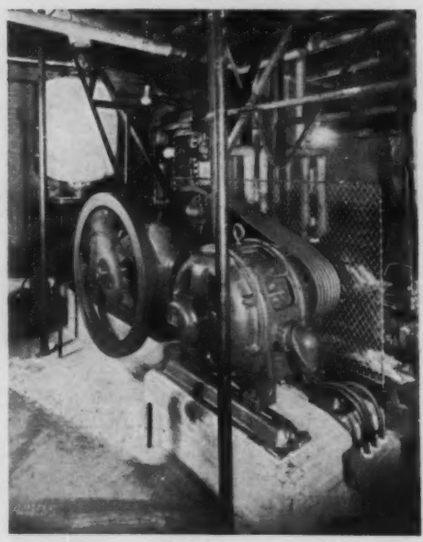
Operating experiences have shown that when a heavy surge occurs on either of the systems, the alarm bell rings. This is caused by the contacts of the power directional relay closing first at one end of the line and then the other as the surge (which is equivalent to a three-phase fault) travels back and forth. The oil circuit breakers do not trip out as these contacts open at one end before they can close at the other end. It was not desired to have the oil circuit breaker trip under such circumstances so the operation is correct, and the ringing of the alarm bell is not undesirable since it warns the substation operator of system trouble.

## Electricity Pumps Steam, Replaces Isolated Plant

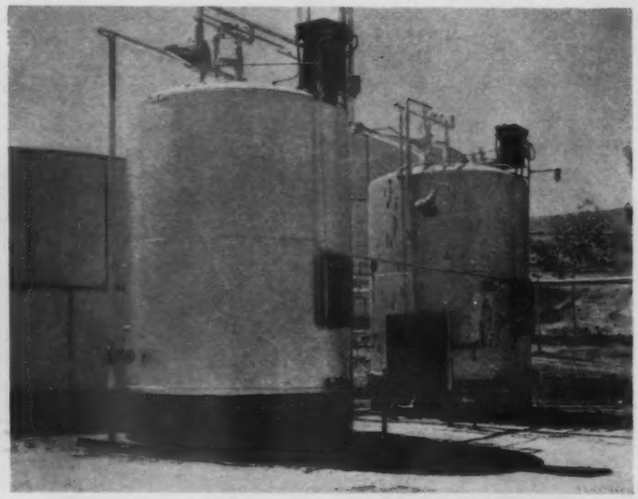
When the 600-room Multnomah Hotel of Portland abandoned its isolated steam electric plant and agreed to take all electric energy and steam from the Northwestern Electric Co., a difficulty was encountered. It was: how to supply the hotel's laundry and pressing machines with 85-lb. steam when Northwestern's steam mains carried but 12 lb. per sq. in.

This difficulty recently was neatly surmounted by installation of the steam pump pictured above. It is 12 x 11-in., 300-r.p.m. steam booster, driven through seven V belts by a 100-hp., 870-r.p.m., 220-volt, 3-phase motor. For economy, it is equipped with an adjustable automatic unloader, designed to maintain constant discharge steam pressure and actuated by 40-lb. compressed air.

Steam from the company's mains is taken at 12 lb., 250 deg., 1,165 B.t.u per lb., 6 deg. superheat, and is discharged at 87 lb., 395 deg., 1,223 B.t.u. per lb., 66 deg. superheat.

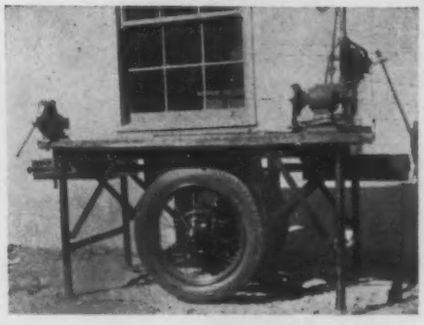


Overpowered 25-per-cent, the unit has performed as guaranteed, and steam cost (electricity included) compares well with any practicable, competitive means.



To dehydrate crude oil, Union Oil Co. is using this electrical equipment, which agglomerates water particles by ionization in a high-potential field. Subject to a potential of 5,000 to 10,000 volts per in., water particles in suspension are ruptured and settle out by gravity. The electrical circuit consists of control board, resistance coil and transformer designed to withstand heavy surges. Uses but .02 kw.-hr. per barrel

To expedite maintenance of switching equipment at outdoor high voltage substations, Pacific Gas & Electric Co. is employing this portable workbench. Mounted on wheels salvaged from automobiles, it carries drill-press, emery wheel and vice, extension outlets for tools and lights, oxygen and acetylene tanks and a tool drawer



To check flaws in the enamel coating on a 10-mi. steel siphon on the distributing system of the Metropolitan Water District, Los Angeles, inspectors use an electric wire brush as illustrated at side. Box shown atop the siphon is a transformer which steps up current used from 110 to 5,000 volts. The terminal of a conductor is grounded on the pipe. When pinholes are present in the enamel an arc jumps 3/8 in. between the wire brush and the pipe

# Meridians for Electric Rates

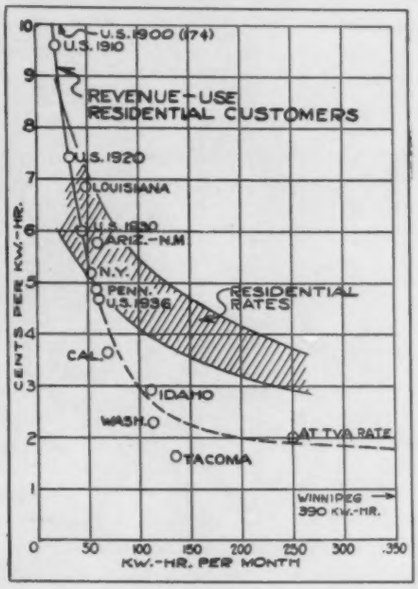
By GEORGE A. FLEMING
Denver, Colorado

AN ANSWER to the question "Are your electric rates high or low?" requires reference meridians, just as a question regarding the geographical location of a city, requires a map. The curves on the accompanying chart may be used effectively as such meridians in visualizing the relations between rates, use and revenue, which are essential to any logical comparison of rates and discussion of rate trends.

The shaded area on the chart covers a band of typical residential electric rates in the United States for Jan. 1, 1935, representing the latest available data. The upper and lower boundaries are the averages in the high and low geographical divisions, being, respectively: the West South Central States of Arkansas, Louisiana, Oklahoma, and Texas; and the Pacific States of California, Oregon and Washington.

Historic unit revenues are shown by the solid portion of the revenue-use curve, which illustrates the continued decrease in the average unit cost of electricity for residential use in the United States from the year 1900 to 1936, and its consistent relationship to the amount of energy used. For comparison with this curve, there have been plotted statistical points on average residential revenue and use in several localities for the year 1936. And for further comparison, it is pertinent to note that the revenue-use average for customers of all classes in the United States has decreased from approximately 3.5c per kw.-hr. at 203 kw.-hr. per month per customer in 1907 to 2.3c and approximately 290 kw.-hr. in 1936. The statistics are principally from publications of the Federal Power Commission and the Edison Electric Institute.

These data, in themselves, form rate reference meridians and indicate future trends. Recognizing that costs may vary greatly with time and the development in an art, it is remarkable how constant has been the relation between average revenue and use, especially when they are considered as elements of a basic rate or cost equation of the three-part type. For its value in further visualizing relations, but not as offering a prediction, constants for an empirical three-part rate form were chosen to fit the historic revenue-use curve and to extend it in a not unreasonable manner as shown by the dotted line. The elements of the reference rate thus developed are as follows: an energy charge of ½c per kw.-hr.; a customer charge of $1.00 per month; and a demand charge of $2.75 per kva. of distribution transformer capacity for small lighting loads, decreasing to the more probable future figure of approximately $2.00 per kva. for highly electrified residences.



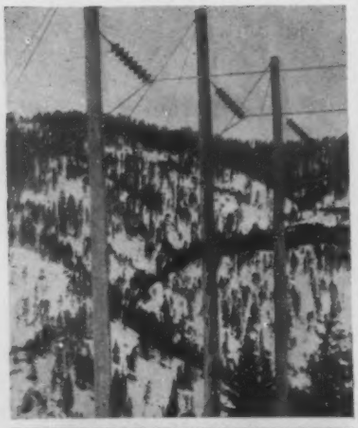

Deviation of the revenue-use curve from the rate area is more apparent than real. The area applies to the rates in effect on January 1, 1935, and should be compared with the average of the 1934 and 1935 revenue points, or 5.15c per kw.-hr. on the revenue-use line. Further, in averaging rates equal weight is given to the rates in all communities, regardless of use; while in determining revenue-use data, added weight is given to rates in communities in proportion to their use, thus emphasizing communities with high use and low rates. This results in placing the average unit revenue point below the corresponding average rate.

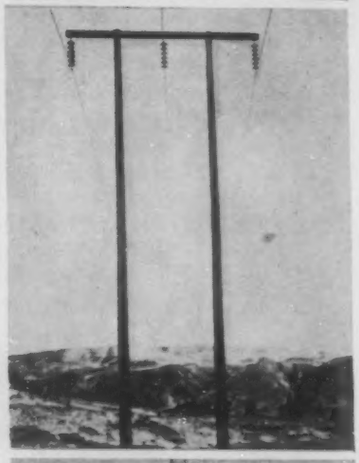
As average customer use increases, it appears reasonable to expect periodic decreases in rates to bring the rate area closer and closer to the revenue-use line. Preliminary data for 1937 indicate a revenue-use point of 4.37c per kw.-hr. at 66.5 kw.-hr. per customer. This average unit revenue is 0.4c below the corresponding use point on the lower edge of the 1935 rate area and would indicate that the 1938 rate area is around 0.5c below the area shown.

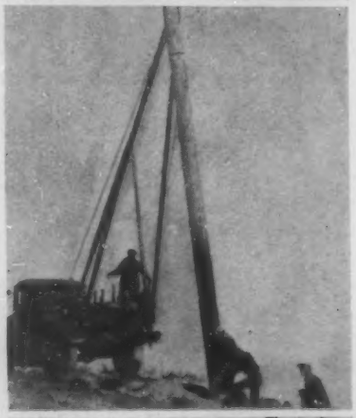
A recent analysis of 20,000,000 residential customers indicates that the following relationships may reasonably be used in making comparisons: approximately 67 per cent use electricity for lights and small appliances only, with an average consumption of about 25 kw.-hr. per month; approximately 27 per cent use electricity for refrigeration, also, and consume an average of around 100 kw.-hr. per month; approximately 4.4 per cent use electric cooking, in addition to the above, with an average of about 250 kw.-hr. per month; and further, that approximately 1.6 per cent use electric water heaters, in addition, with a monthly consumption approximating an average of 500 kw.-hr. per month.

In reaching conclusions from a comparison of various rates it is well to recognize that there is practically no such thing as an average customer, and to note the following quotation from the electric rate survey report of the Federal Power Commission, "Availability of fuel resources and accessibility of water power go far in some instances, to explain the differences in rate levels. Geographic and economic conditions have a marked influence, as do the varying tax policies of the several states and communities. Density of population, seasonal requirements, presence or absence of large industries, variations in the purchasing power of the people, and even climatic conditions may give rise to differences not otherwise explainable. Finally, reference might be made to the extent of the authority and the effectiveness of State regulatory bodies, as well as the influence of competition."

With such a list of controlling factors, it is surprising that a relatively high degree of consistency in the rate and use data can be shown. Further, it appears that contrary to popular belief, the average small lighting customer rceeives energy at less than the median rate for his use. This condition is a recognized handicap to the use of rapidly decreasing rates for higher uses, but with the evident possibilities for very much higher customer consumption there can be little doubt of the benefits obtainable through an even wider sales effort and extended use of promotional rates.







# Constructing Transmission

## *Practices of Northwest Systems*

By LESTER R. GAMBLE
Washington Water Power Co.
Spokane, Wash.

ECONOMICS of long spans and structural simplicity have, during the last few years, been major considerations of the utilities which have planned and built transmission lines to serve the Pacific Northwest. Among important contributions to practice have been those of Montana Power Co., Puget Sound Power & Light Co., Pacific Power & Light Co., Seattle City Light, and Washington Water Power Co.

### Montana: Anaconda

In 1936 and 1937, The Montana Power Co. built two lines, one for 154 kv., but operating initially at 100 kv., between Flathead plant and Anaconda, and the other for 100 kv., and operating at that voltage, between Thompson Falls and Flathead. No particularly novel features have been incorporated in these lines, other than maximum simplicity. Complete and in service, the lines give the impression of being both substantial and inexpensive, with materials utilized to good advantage in a well-balanced design.

The Flathead-Anaconda Line is 144 mi. in length and traverses varied terrain, ranging from prairie to timbered mountains. It is of typical H-frame wood construction with conventional types of strain, two-pole and three-pole angle structures.

Conductors consist of 350,000-cir.mil, 19-strand, hard-drawn copper, spaced horizontally at 13 ft. Nominal span is 700 ft., average 675 ft., maximum 2,400 ft. Conductors were sagged for 4,000 lb. tension at 60 deg. F. All sleeves were of the Anaconda compression type.

Class 2, A.S.A. pentrex-treated poles, having a normal length of 55 ft. were used. The poles were roofed with one square cut. Crossarm gains were 2 in. deep cut 13 in. down from the pole top. This provided a shelf for the crossarm and thereby relieved the through-bolt of vertical load. Construction is shown in Figs. 1 and 2.

To prevent poles from being split when struck by lightning, a No. 9, iron, pole-ground wire was stapled the full length of the pole and wrapped with two or three turns around the butt. No pole ground wire was used on guyed structures.

Crossarms were 6x10 in. by 28 ft., unsurfaced Douglas fir; the unsurfaced timber being used to save ¼-in. in sectional dimensions and thereby increase the strength. Some consideration was given to the relative life of surfaced and unsurfaced timbers. In consideration of Montana climate, it was believed that absence of surface would not materially decrease crossarm life.

Insulators were standard ball and socket suspension units, spaced 5¾ in. Eight units were used in suspension and nine in strain. Insulator hardware was left unbonded in order that the wood cross-arm could be utilized to reduce the probability of flash-over of insulator strings.

Standard ½-in. Siemens-Martin guy strand was used for guys. Anchor rods were ¾-in. x 9 ft., the anchors being 20-in. cast-iron cones. Guy wires were attached to the poles by means of a slip loop, made up by placing a thimble guy in the end of the cable and serving it up with a Crosby clamp. A lag bolt was used to hold the guy wire in position.

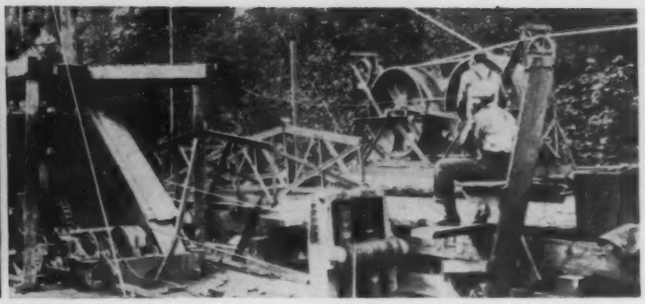
### Montana: Thompson Falls

The 100-kv. line, 56 mi. long, was constructed between Thompson Falls and the Flathead plant, its design being similar to the foregoing.

Conductor was No. 4/0, 12-strand, hard-drawn copper. Nominal span was 700 ft., average 625 ft., maximum 1,150 ft. Conductors were sagged for 2,400 lb. tension at 60 deg. F.

Class 3, A.S.A. pentrex treated poles were used, nominal height being 55 ft.

Fig. 1—3-pole angle structure. Fig. 2—154-kv. transposition. Fig. 3—100-kv. suspension structure (154-kv. differs only in insulation). Fig. 4—Pole-setting and hole-digging machine. Fig. 5—Conductor-splicing machine



Crossarms were 5x8 in. by 22 ft., unsurfaced Douglas Fir. Fig. 3 shows a typical suspension structure.

Power machinery was used wherever possible for digging holes, erecting poles and handling material. Where ground conditions were favorable, holes were dug by means of a hole digging machine, while individual poles were erected by means of a truck derrick, as shown in Fig. 4. Crossarms with insulators were raised to position by using small pole-gins attached to the top of the poles. Conductor splices were made by the use of the Anaconda compression type sleeve (Fig. 5).

Many sections required extensive use of manual labor on account of inaccessibility and rough terrain, and about one-half the line was constructed under very severe weather, with temperatures ranging from -30° accompanied by considerable snow.

### Puget Sound

Puget Sound Power & Light Co. has constructed some extensions to existing lines and made replacements of various sections of old lines. In the replacement of old pin-type lines operating at 33 kv. and above, suspension type construction has been used. The change to suspension for these lines has been necessary in order to mitigate, as far as possible, radio interference troubles attributed to the pin-type lines. This company reports that the suspension construction has not increased the cost of such lines, especially if the conductor in the line to be reconstructed has sufficient strength to permit longer spans.

**NORTHWEST ASSOCIATION REPORT**
To be presented at the 1938 meeting of the Transmission & Distribution Committee, E. F. Pearson, chairman, Engineering & Operation Section, Northwest Electric Light & Power Assn.

Two general types of suspension construction are being used: single pole-wishbone along roads and in congested areas, and H-frame, wood type in open country and where the use of longer spans is permitted.

### Seattle: Skagit

The City of Seattle is at the present time constructing a double circuit, 240-kv. steel-tower line, approximately 120 mi., from Diablo plant on Skagit River to South City substation in Seattle. This line in general follows the Skagit canyon, which is extremely rough. Towers are located at long intervals on jutting points in the canyon walls. The frequency of snowslides and avalanches necessitated considerable care in locating structures. Four types were used (Figs. 6 and 7): Type A, light tangent tower; Type B, heavy tangent and light angle tower; Type C, heavy angle tower, and Type D, deadend tower. There are 578 towers in all, foundations being pad and pedestal with leg angles encased in reinforced concrete and set to a depth of 10½ to 14 ft. Tower weights vary from 15,000 lb. for Type A to 31,000 lb. for Type D. The standard tower is 110 ft. overall, maximum height is 155 ft.

The six conductors are 795,000-circ. mil A.C.S.R., each circuit having a rated capacity of 200,000 kva. and a normal of 120,000 kva. Normal conductor tension is 7,500 lb., sagged for a maximum of 14,500 lb. at 0 deg. F., an 8-lb. wind with ½-in. ice. Normal span is 1,200 ft., minimum 395 ft., maximum 3,300 ft. Configuration is vertical with 17 ft. between wires vertically, the middle conductor being offset 3.5 ft. Minimum horizontal space between the

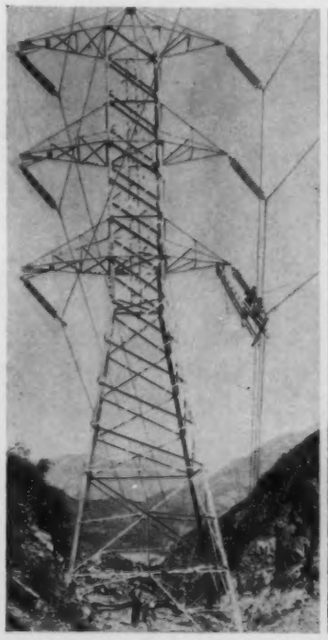


Fig. 6—(extreme left bottom) Type-B tower, 240-kv.

Fig. 7—(left center bottom) Type-C tower, 240-kv.

Fig. 8—(top of page left) Clearing right of way for the Skagit line

Fig. 9—(top of page right) Tension machine for stringing conductor, Skagit line

Fig. 10—(right bottom) Rigging for erecting towers

two circuits is 27 ft. A ground wire is carried at the peak of the tower 18 ft. above the upper conductor. The ground wire is used only in the canyon section of the line. The lower conductor in the tower is 63 ft. above ground. A 30-ft. ground clearance is maintained, normal clearance between conductors and towers being 80 in. Minimum clearance under the most severe loading conditions is 60 in.

Insulators have a 15,000-lb. M. & E. rating, 14 units being used in suspension, 16 in strain. Double and triple yokes are used as required to meet the maximum conductor tension. No grading shields or arcing horns are provided. Conductors are attached to insulators by clamps which have been designed to slip at 5,000 lb. Armor rods are used at all suspension positions. Deadends are of the compression type.

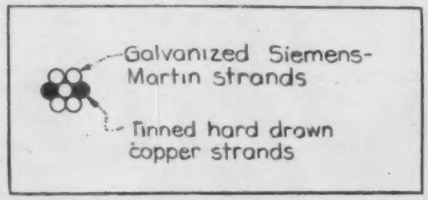
Clearing of the right of way was one of the major problems in the construction of the line. Much of the construction was mechanized as is illustrated in Figs. 8, 9 and 10.

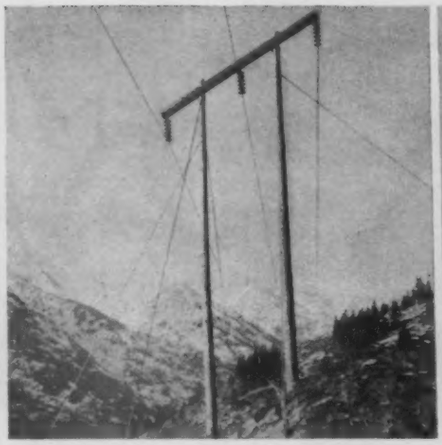
The Pacific Power & Light Co. recently has constructed a 16-mi. transmission line, between the Ariel Plant and Kalama, Wash., over very rough country. Upon completion of surveys, possible types of conductor were studied for economy over the given profile. Rugged terrain practically demanded long spans. Selected was a conductor having six strands of No. 8 copper and one of No. 8 Copperweld; the constructed cable being equivalent to No. 1/0 copper, but with ultimate strength of 5,960 lb. The conductor was sagged for a tension of 3,250 lb. or 55 per cent of the ultimate. Maximum loading was assumed for ¼-in. ice and an 8-lb. wind. Conductors were spaced at 11 ft. 6 in. for spans up to 1,500 ft., deadended on three-pole structures and spaced at 16 ft. on longer spans. Average span was 907 ft., maximum 1,920 ft., 25 per cent exceeded 1,200 ft. Four units of 10-in. Pyrex insulators were used.

The line is operated at 66 kv., but the spacing of the conductors and the design in general will permit operation at 110 kv.

Lightning protection consists of pole ground wires located about every 2,000 ft. along the line. Spill gaps are provided at both terminals of the line. No lightning arresters or other lightning protective devices are used.

Fig. 11—Steel-copper composite conductor



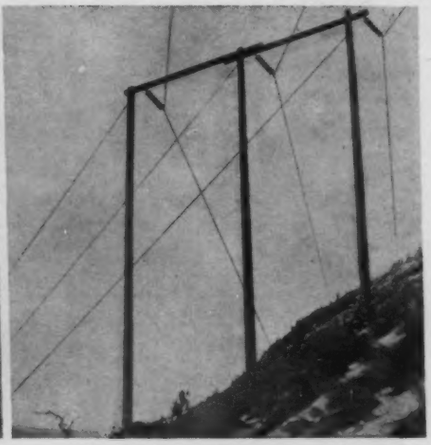


Fig. 12—(left) Two-pole storm-guyed structure
Fig. 13—(right) Three-pole angle structure

## Washington Water Power Company

By EARL BAUGHN

SEVERAL additions to transmission facilities of The Washington Water Power Co. recently have led to developments in construction methods. Particularly did construction of the Chelan line necessitate the adoption of new techniques. The planning and execution of these jobs led to the current practices outlined as follows.

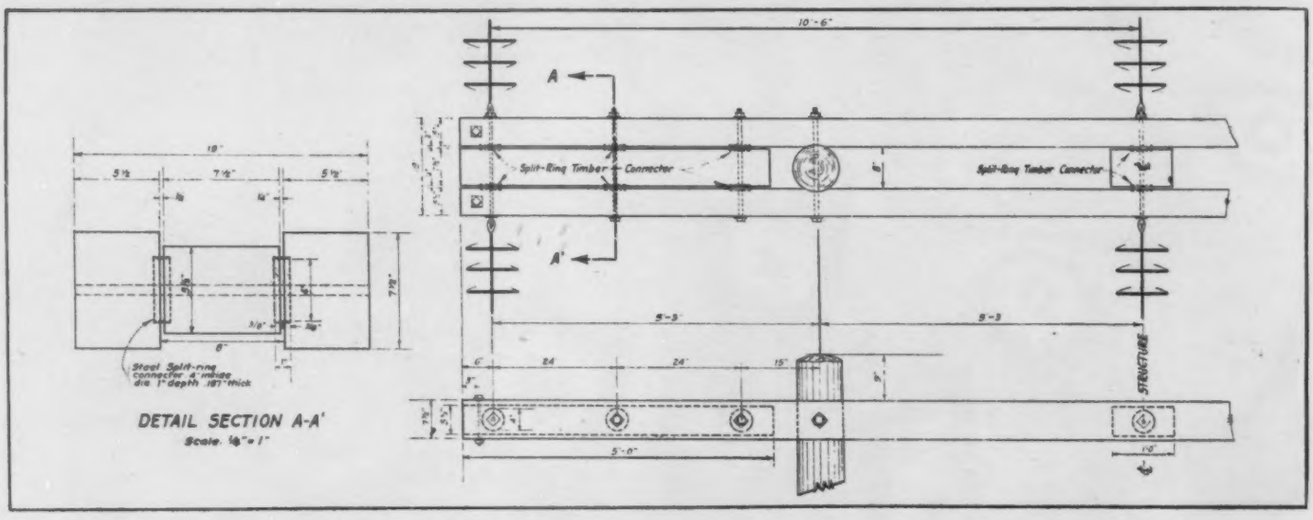
### Conductors

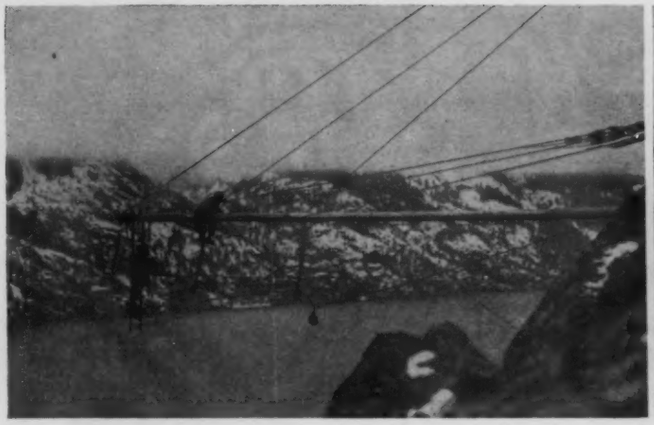
On several transmission lines built during the last few years, Washington Water Power has employed a composite conductor consisting of one strand of high strength copperweld and six strands of hard drawn copper. The single strand of copperweld is placed in the center of the seven-strand cable. Cables using larger numbers of copperweld in combination with copper also have been developed by the Copperweld Co. but W.W.P. has used only the first-mentioned type, having the following characteristics:

Equivalent conductivity—No. 0
Diameter—0.384-in.
Weight per foot—.354 lb.
Ultimate strength—6,180 lb.
Coefficient of expansion—.0000089
Modulus of elasticity—17,100,000

Primary reason for its use is greater strength, which allows longer spans.

Fig. 14—detail of timber-joint connectors





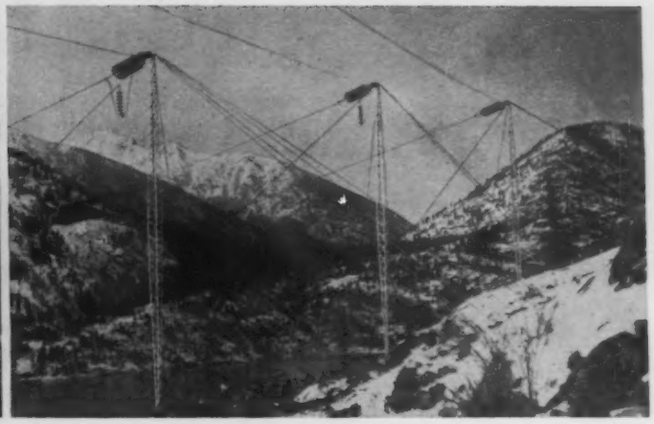


Fig. 15—(left) Boom-arm structure, Chelan line
Fig. 16—(right) Chelan lake crossing, North side

This is desirable in farming communities as it is often possible, by careful line location, to place practically all the structures in fence lines, uncultivated strips, pasture land or other locations not objectionable to the land owner, thus achieving material reduction in right of way cost.

Longer spans reduce the number of structures. This item alone more than offsets the greater cost of the conductor as compared to an all-copper cable of the same conductivity. It has been found that the average span of lines constructed of this conductor is about 800 ft. as compared to about 600 ft. for similar lines using medium hard-drawn copper cable of approximately the same diameter.

*Steel-Copper Composite* — Recently completed is a line in which the conductor consists of five strands of Siemens-Martin steel and two strands of tinned copper. The line is 53 mi. and supplies a relatively small mining load. Since the voltage (110 kv.) was determined by that available at the supply station, it was desirable to use a conductor which had the diameter necessary for 110 kv., had strength sufficient to allow long spans and at the same time was low in cost. After considering several possibilities, the steel-copper composite was chosen. Characteristics are:

Diameter—.444 in.
Weight per foot—.416 lb.
Breaking strength—9,000 lb.
Modulus of elasticity—20,000,000
Coefficient of expansion—0.0000067
A.C. resistance—1.11 ohm per mi.

Relative positions of the steel and copper strands are shown in Fig. 11.

The copper strands are hard drawn, tinned to prevent electrolytic action between the copper and zinc. Splices were made with twisted sleeves of heavy-weight tinned copper. Tests showed that 90 per cent or more of the strength of the wire was developed in the splices.

The sag-tension calculations were based on a maximum tension of 4,000 lb. under medium loading. The resulting sag is 25 ft. in a 1,000-ft. span at 60 deg., and a tension of approximately 2,200 lb. Average span in this line is 938 ft., maximum 2,683 ft. Spans of 1,800 to 2,000 ft. are not uncommon. The line is located for the most part along the shores of Lake Chelan and a large percentage of the structures are set in solid granite; therefore the use of a high strength conductor and long spans reduced cost.

**Structures**

*Side Hill Structures*—Most recent structures have been of the conventional two-pole H-type. However, one interesting modification was made on the same line along Lake Chelan on which the steel-copper composite conductor was used. This line follows the shores of the lake for about 25 mi. The slope of the ground is all in one direction. Therefore, it was decided to frame the crossarm parallel with the ground rather than horizontal. The resulting structures are rather odd in appearance until one becomes accustomed to them, but it would seem to be the logical construction to use under the conditions. Not only was there a considerable saving in pole cost (because it was possible to use a pole of the same height on the down-hill side as on the up-hill side), but also there was a saving in handling and erection cost. This item was of more importance on this line than it would be on most due to the transportation and construction difficulties encountered along Lake Chelan. Photographs of typical structures are shown in Figs. 12 and 13.

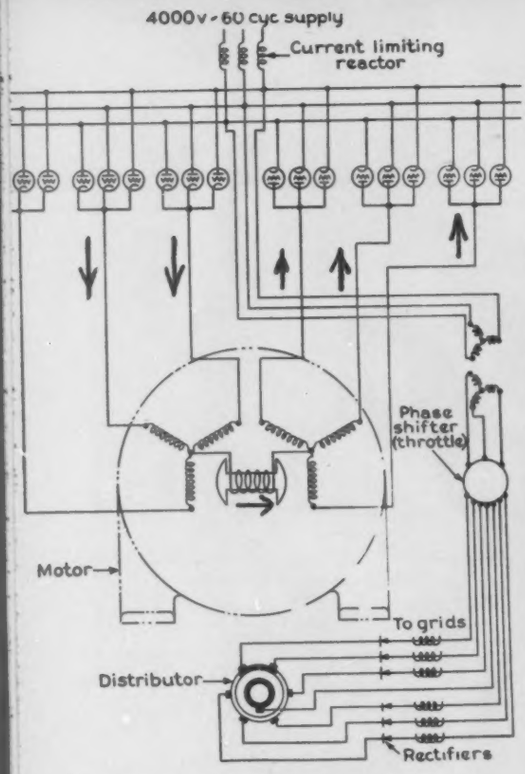
*Timber Rings*—It has long been the practice of this company to use timber ring connectors similar to those used in timber bridge and roof truss construction in all double-arm structures which involve the bolting of wood blocks between the crossarms. These ring connectors consist of 4-in. cylinders 1 in. long and $\frac{1}{8}$ in. thick set in grooves cut in the face of the crossarms and blocks. The grooves are cut $\frac{3}{8}$ in. deep so that there is a $\frac{1}{4}$-in. space between the crossarm and wood block when assembled. This is done so that the face of the crossarm will dry out quickly as it has been found that if the crossarm and block are bolted tightly face to face there is a tendency for rot to develop at these points in damp climates. The use of the timber ring connector not only provides the desirable separation but also increases the strength and rigidity of the crossarm assembly. A typical double arm assembly is shown in Fig. 14.

*Boom Arm*—At two locations in the Chelan line it was not possibe to set conventional pole structures because of the steepness of cliffs. The conductors at these points are supported by boom arms consisting of 50-ft. lengths of 8-in. galvanized pipe attached to the cliff and supported by vertical and horizontal guys. The pipe is attached to the cliff through a universal joint so that it is free to move in any direction but is held in place by the guys (Fig. 15).

*Chelan Lake Crossing Structures*—Across Lake Chelan the line is supported on unique structures. The span is 4,651 ft. and the conductor used is 9/16-in. copperweld. The shore line at the point chosen for the crossing is very precipitous, but it was possible to find a convenient bench on each side at approximately 380 ft. above water surface. This made high towers unnecessary so it was decided to support the ends of each conductor on an individual steel strut. These struts are 50 ft. in length, rest on small concrete foundations and are supported by guys. As each strut weighs but 800 lb., transportation and erection were very easy. Also the amount of concrete required in the foundations was small.

The structures are located 50 ft. apart horizontally and are offset 12.5 ft. in the direction of the crossing span so that the incoming and outgoing lines may leave the struts at approximately right angles (Fig. 16).

# Vacuum Tubes in Action




## *IX—The Thyratron Motor*

By H. C. STANLEY
Asst. Engineer, General Electric Co.
San Francisco, Calif.

IN general, all generators produce alternating current in their windings and all motors require alternating current in their windings. D. C. generators supply their output through commutators, and d.c. motors, by means of similar commutators, change the input current back into alternating current, except that portion which is used for excitation.

Inasmuch as the field poles have a fixed polarity, and there are an equal number of north and south poles, and since the armature conductors pass under both the north and south poles it is necessary to reverse the current in the armature conductors as they pass from pole to pole, as the relation between armature current and direction of field flux must remain fixed in order to maintain the direction of torque. Motor torque is produced by the magnetic attraction between fixed field pole magnets and the reversing magnetic poles in the armature. This necessity of pole reversal in the armature has been a very serious stumbling block in the path of the perpetual motion type of inventors who have been struggling to perfect a motor that would run by means of a combination of permanent magnets, without the aid of power company electricity.

In the case of synchronous motors, the relation of field and armature polarity is correct at synchronous speed, since the current in the armature conductors reverses as these conductors pass from pole to pole. In the case of induction motors the relation is correct at any speed as the field in the rotor is induced by the armature current.

The thyratron motor, which is in the developmental stage, and therefore restricted at present to certain trial applications, is an ingenious arrangement whereby thyratrons very ably take care of the necessary relationship between field flux and armature flux, and also provide direct current for the field. Another valuable service offered by these tubes is the complete control of power input. In general, one form of this motor is similar to the standard revolving field synchronous motor, and takes its power from a 3-phase supply.

The sketch shows the arrangement of thyratrons and motor windings, in one form of the thyratron motor.

A total of 18 thyratrons is used, the 9 thyratrons on the left have their anodes connected to the lines, and the 9 thyratrons on the right have their cathodes connected to the lines. Inasmuch as current flows from anode to cathode, any flow of current will always be in the direction shown by the arrows. Since the revolving field is connected between the two groups of armature windings the current in the revolving field is always in the same direction thus establishing a direct-current field in the rotor. The distributor shown at the bottom of the sketch is attached to the motor shaft. The connections between the grid transformers and the grids of the thyratrons are not shown. The grid transformers have provision for individual excitation to the grid of each tube. However, in order to have a flow of current it is necessary to have the grid transformers place 6 tubes in condition to conduct current. For instance, when it is required to pass current through the lower left-hand motor winding, one of the tubes in the extreme left-hand group must conduct this current. The phase relation of the line voltage with respect to the grid transformer voltage, will determine which tube is needed, but all 3 tubes of this group must be ready to conduct current, as the flow of current in any motor winding has no fixed relationship to the frequency of the line. The current passes through the motor winding above referred to then through the field and then through one of the right-hand motor windings and back to the line. In order that the current may flow back to the line one of the right-hand groups of tubes must be in condition to conduct, thus making it necessary to have 6 tubes ready to fire at all times. Each distributor brush controls a group of 3 tubes, and 2 brushes are always in contact with the revolving segment.

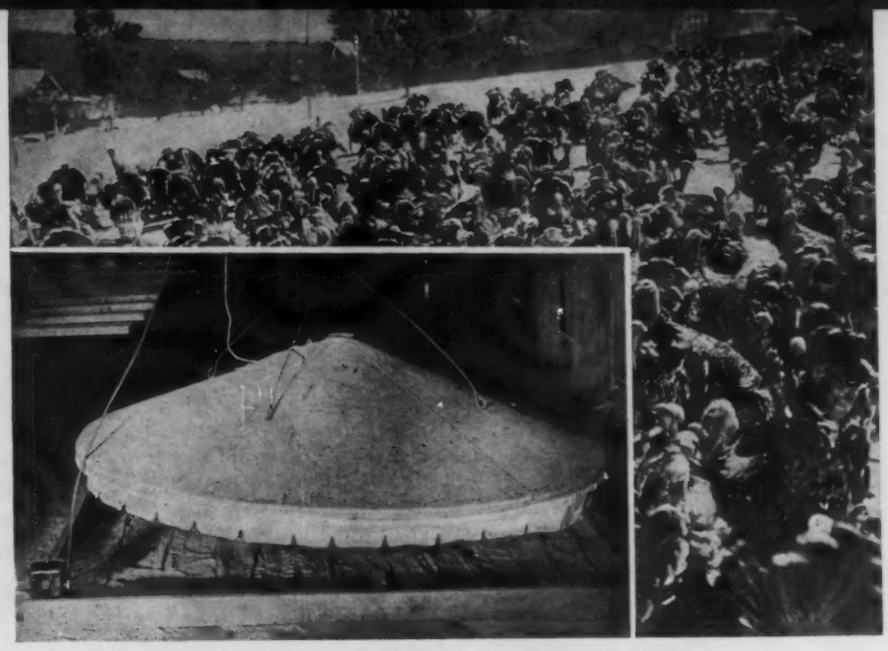
The distributor has complete control of current flowing in the motor windings, and as this distributor is attached to the motor shaft, this means that the motor winding current has a definite relationship to the position of the revolving field. In other words, the revolving field determines when any individual motor winding should pass current thus making the relationship of armature current to revolving field position always correct.

Notwithstanding the fact that the motor is being supplied with unidirectional current the magnetic effect in the armature is the same as in the conventional motor, that is, the resultant flux shifts in position as the field revolves. Current passing into the motor builds up a flux resultant in one direction; but as the field revolves the current in one individual winding is cut off so that the flux component resulting therefrom decreases and dies out, and this is followed by the beginning of current flow in another winding which builds up a flux component in the same magnetic circuit which will combine with the existing flux component to produce a resultant flux which has a new position. The frequency of the rotation of the flux resultants is determined by the speed of rotation of the motor itself and has no relationship to the frequency of the power supply.

The phase shifter shown on the right of the sketch is an arrangement for controlling phase shift of the grid transformer voltage relative to the line voltage. The distributor determines how much current can pass when they fire. In other words, the phase shifter acts as a throttle. The primary winding of the phase shifter is energized from the line and the secondary winding can be rotated to give any phase relation required on the grids with respect to the anode voltage.

Thus we have a motor that takes power from an a.c. supply that can be operated over a wide range in speed, and controlled by a simple throttle arrangement. The efficiency is high at reduced speeds as compared with the usual variable speed a.c. motors, since power consuming resistors are not required.

NOTE: Details covering a 400-hp. motor of this type, which is the only "Thyratron" motor commercially applied and which has been used to obtain field operating data, are given in a paper by Alex Anderson and Mittag, published in the November 1934 issue of Electrical Engineering. The January 1938 issue contains a paper by Mr. A. H. Beiler giving operating experience on this same motor.



## New Technique in Brooding Turkeys

Excellent results in reducing brooding mortality and in preventing crowding under the brooder have been achieved on the Prikett ranch in Simi Valley, near Moorpark, Calif. The system employs a combination of a regular forced draft ventilation brooder plus underheat provided by soil heating cable buried in sand. Hitherto, usual practice has been to employ one or the other of these systems singly.

A square boarded enclosure slightly wider than the diameter of the forced draft brooder is laid over a sheet of tar paper which keeps out moisture. Next, three inches of sand are placed in the enclosure. Seventy-five feet of soil heating cable are laid in the sand in loops approximately six inches apart. Two inches of sand covering the cable complete the brooder floor. Temperature is maintained at 70 deg. F. by means of a thermostat.

The forced draft brooder provides essential ventilation and fresh warm air; the supplemental heat from below tends to give an even temperature gradient over the entire area and prevent crowding. The pictures show the brooder setup with the soil heating cable in place and a few of the several thousand toms brooded electrically last season and now being fattened for market.

# Regulations For Safe and Sane Farm Wiring

By GEORGE E. KIMBALL*
Electrical Engineer, California Industrial Accident Commission

THERE are a great many rural electrical installations made by persons who have just enough knowledge of the subject to see that the equipment is connected to the source of energy but not enough to see that this is done correctly. This unsafe practice results in an unnecessary number of electrical fires and accidents. Consequently, those charged with promoting rural electrification have an obligation to see that the equipment they recommend to the farmer is installed safely and used properly.

Several types of wiring methods may be used. Identified wiring is required on all lighting circuits. Work should be done by a qualified electrician, and the wiring method approved for the location and duty should be employed.

In California the Electrical Safety Orders of the Industrial Accident Commission provide fair and just regulation of wiring which applies to all places of employment within the state. The following discussion is based upon these orders.

*Open Wiring:* The use of exposed wiring is restricted. By open or exposed wiring it is meant that wiring installed on an exposed surface and not protected within the finished walls or partitions of the building. Open wiring is permitted in attics where there is no stair way and entrance which would make the space convenient as storage room. There are other places where guard strips might be applied to cover open wiring and be partly satisfactory, but as a rule other suitable wiring methods are less expensive. Open wiring is not permitted for power installations.

*Concealed Knob and Tube Work:* This is the type of wiring that is used in the majority of rural homes. The conductors are placed in the walls and partitions when the building is erected and are not exposed as in open wiring. When properly installed, this wiring method is considered safe and satisfactory.

### For Lighting Installations

*Conduit Work:* Rigid and flexible conduit are commonly used for power and lighting installations. Flexible conduit is used in places where it is impracticable or impossible to install rigid conduit and is, as a rule, more expensive and less satisfactory than rigid conduit. If flexible conduit is exposed to mechanical injury or vibration it is difficult to keep it securely fastened to the outlet boxes and other conduit terminal fittings used throughout the system. Rigid conduit is secured in all such places by locknuts and bushings. It is used almost exclusively for the installation of electrical connections in irrigation pumping plants and other motor-driven equipment. Short lengths of flexible conduit may be used at motors where flexibility is required.

*Armored Cable:* Approved armored cable may be used as the wiring method if properly protected from mechanical injury. It has the same disadvantages as flexible conduit. Unless it is the type which has lead-covered insulated conductors under the armor it can be used only in dry locations. Armored cable is not to be used in locations where there is oil.

*Non-Metallic Sheathed Cable:* The installation of this method of wiring is subject to the same restrictions as open wiring. It is not to be used where exposed to mechanical injury but may be used in lieu of concealed knob and tube wiring within finished walls and partitions. It is not permitted for power installations or as portable cable.

*Electrical Metallic Tubing:* This material is similar to conduit but has a thin wall and should not be used where subject to mechanical injury. It is customarily employed for both power and light wiring.

*Grounding:* In considering the above methods of wiring, you will note that particular attention is given to the enclosing and guarding of conductors. When these enclosures are of metal it is necessary to ground the metal so that if any current-carrying conductor comes in contact with the metal enclosure, the current will be carried harmlessly to ground. The effectiveness of this grounding is a very important factor in the operation of the overcurrent pro-

* Extracted from a paper before the Tenth Annual Rural Electric Conference, University of California, Davis.

tective device for the conductor: the fuse or circuit-breaker.

If the ground and its connections are of high resistance, the over-current protective device will not be operated. Under such conditions the metal enclosure would also become a current-carrying part and is liable to cause a fire or an accident. If, however, the ground is good and of low resistance, the current will be carried to earth until the overcurrent protective device is operated.

*Overcurrent Protection:* The purpose of fuses or circuit-breakers is to disconnect the circuit from the source of energy in the event that the conductors are short-circuited or grounded. Only the fuse or circuit-breaker approved for protecting a conductor of the size employed should be used in the circuit. Bridging fuses or using metal straps for shunting the protective devices introduce a serious hazard and should never be practiced or permitted under any circumstances.

*Motor Installation:* Motor wiring is required to be in conduit or other approved metallic raceways. The overcurrent protective device for the motor circuit may be an approved enclosed, externally-operated, fused switch or an enclosed circuit-breaker. Fuses without a disconnecting switch directly ahead of them are not approved. When fuses are so used it is necessary to enclose them in a metal enclosure, connected by conduit to an enclosed, externally-operated switch directly ahead of them. Such a combination would be more expensive than an approved enclosed externally-operated fused switch.

The motor control device must be equipped with motor running overcurrent protection, and if the motor is driving shafting or any form of equipment which would be dangerous when suddenly re-started after a failure of power, low-voltage release protection is required. Mechanical guarding is required for all hazardous parts of equipment.

### Important Safeguards

Such safeguards are very important, but on the ranch they have been generally overlooked. The grounding of motors, of the noncurrent carrying metal parts of motor control equipment and of the conduit or other metal enclosures within which the motor branch circuit wires are carried is important. Because of the high voltages of these circuits and the greater carrying capacity of the overcurrent protective devices, grounding connections should always be made to a water pipe ground if one is available. At pumping plants such grounding connections may be made to the well casing but not to intake or overflow.

*Portable Cords and Cables:* Only approved portable extension lamps are to be used. These are equipped with lamp holders having handles and lamp guards of rugged construction. Ordinary twisted lamp cord, which is approved only for pendant lamps in dry places, should never be used for portable extension lamps. Brass-shell lamp sockets have been responsible for many deaths in this state. In wet places, the paper lining of the socket provides no insulation when it becomes moist. The base of the lamp is usually exposed at the socket of the brass-shell lamp holders where it may come into contact with a clamped on lamp guard commonly used on such extensions.

### Extra Grounding Conductor

Portable cables used with portable motors are required to have an additional grounding conductor in the cable for grounding the frame of the motor or the noncurrent-carrying metal parts of any other electrical equipment which may be connected to the cable. This requirement applies to all motor-driven tools which are held in hand while operating.

*Portable Immersion Heaters:* There have been several electrocutions reported within the last year from the use of this type of unapproved device. In most of these cases the death occurred when an immersion heater was placed in a bath tub for warming the water. The use of these devices, or any other electrical device, within reach of a bath tub or any grounded bath room fixtures is very dangerous. Portable heaters particularly should never be used in a bathroom or near a grounded surface.

*Soil-Heating Cable Installations:* Current flowing through a conductor causes a rise in temperature in that conductor. This fact makes possible the construction of soil-heating cable. A special type of conductor is used to generate in the cable the maximum amount of heat with the minimum of current. The conductor is insulated with a heat-resisting insulating covering and is surrounded by a metal jacket which tends to prevent mechanical injury of the conductor. Wiring for soil heating cable installations must be made in compliance with the general requirements of the Electrical Safety Orders and should be connected to supply conductors not exceeding 150 volts to ground or 250 volts between conductors. Circuits supplying soil-heating cables should be wired in rigid metal conduit or electrical metallic tubing. In wet locations, lead covered conductors in armored cable or armored service entrance cable should be used. Open wiring is not permitted. Circuits for soil-heating cable must be protected with fuses or other overcurrent protective devices rated at not to exceed 15 amp.

Where thermostats are used in the circuit, they are required to disconnect the ungrounded conductor or conductors to the surface but may also simultaneously disconnect the grounded conductor. The metallic sheath of the soil-heating cable must be effectively grounded and such grounding connections should be made at the point where the cable is connected to the branch circuit. If the cable is connected by means of a plug and receptacle, an additional grounding connection is required in the plug and receptacle so that the ground will be applied to the sheath of the cable when the plug is inserted.

*Insect Electrocutors:* There are two types of these devices. The ordinary type of fly trap or fly screen, as yet unapproved, has come into general use for killing flies and other insects in the neighborhood of barns, dairies and kitchens. Ordinarily these devices would not be considered hazardous if only the high voltage circuit were to be considered. As this circuit is not grounded and is normally insulated from the primary circuit in the transformer, there would be no potential from the high voltage secondary conductors to ground. The shocking effect, therefore, would be localized in that area of the body which came into contact with the device and there would not be a flow of current from hand to hand or from hand to foot.

### Possibility of a Hazard

Many of these devices are cheaply constructed, and since they have not been given a test by a responsible testing laboratory there is a possibility that the current supplied to the device from lighting circuit may come into contact with the case and present a serious hazard. The cases should be grounded, but no provision is made by the manufacturer for a grounding connection. If any such insect electrocutor is to be continued in use, it should be isolated by elevation where it will be impossible for anyone to come into contact with it while standing on or near a grounded surface.

*Installation and Maintenance:* All electrical installations shall be made in a workmanlike manner and shall be so designed, constructed, installed and maintained that the hazard will be reduced as far as it is reasonably possible. Installations of new utilization equipment and conductors and extensions, repairs and changes in existing installations shall be made only by or under the direction of properly qualified persons. Electricity, when properly installed and used, is safe. When improperly installed and misused, it is dangerous.

# A Bank Lights Up

## How a San Francisco house acquired a 30 ft.-candle level

Elimination of eye-strain, fatigue and headaches coupled with greater accuracy and faster work are dividends credited to a new windowless and glareless lighting installation in the bookkeeping and transit rooms of the First National Bank of San Francisco. The improved conditions result from the installation of more than 100 Westinghouse Magnalux fixtures combined with a special paint job in which all windows were covered first with an opaque paint, then with a coat matching the walls.

The various rooms involved faced on to a central court and received natural light from the windows. Because of this unidirectional light source, extremes of intensities ranged from 100 ft.-candles on the books of a ledger man adjacent to the windows to 5 ft.-candles on the off-side of his adding machine a few feet away. Bright spots in the plane of vision from old direct type fixtures added to the discomfort of employees.

In providing a remedy, illumination engineers of the Westinghouse Electric & Mfg. Co. were called in to make a survey. Their final recommendations were carried out. The new installation consists of 300-watt luminous bowl indirect units spaced on 9-ft. centers. Ceilings and the upper portion of the walls are painted with an 82 per cent reflection factor flat-finish paint. Walls are a light cream. Windows were also painted over. Result is an even level of illumination of 30 ft.-candles that is virtually shadowless.

Employees in one department where the new fixtures were installed asked that the windows be left unpainted. This was done and on dull, sunless days it was found that the intensity next to the windows dropped to 18 ft.-candles as compared to 30 ft.-candles next to the walls. To prevent this loss of light spilled to the outside, these windows were painted over and an even 30 ft.-candle level restored for the entire room. Windows are opened now only at top and bottom to provide air circulation.

Employees in the departments are loud in their praise of the new working conditions. They comment on the great personal comfort and the speed with which they can complete their tasks accurately. Similar equipment has been placed in a new recreation room and dining room provided for employees.

The installation was engineered by K. K. Knopf of the Westinghouse Company and put in under the supervision of Raymond Bradley, bank electrician.

Perfect light for working and relaxing eyes. Above—General view of one section of the relighted bank office. Note painted over windows, which are raised only, as at left, for ventilation. Below—Recreation room

# Engineering Service

## San Diegans get help in designing small jobs

Engineering service on electrical installations, plans and specifications is being made available by San Diego contractors and wholesalers, through the Biddle Trade Bureau, for jobs which do not justify the employment of a regular consulting electrical engineer. Conceived by Sam Weimer, manager of the San Diego office of the bureau, the plan is in the charge of H. W. Reichle, retired Pittsburgh electrical contractor and engineer.

Benefits of the service, which has received the endorsement of the power company, manufacturers, etc., are several: Contractors are saved estimating time and are sure of their specifications; competition is cleaner because it is clear what the owner requires; the architect is relieved of the responsibility of inspecting the electrical part of the job; the owner gets the installation he wants; the general quality of materials is improved, and more adequate wiring installations are promoted.

●

# Stop & Go

## New traffic signal makes appearance in Northwest

New type of traffic signal using red and green lights in the usual way but differing from existing types in that neon tubing furnishes the illumination and that an indicator is provided to show how much longer the signal will operate before switching occurs has been developed by Arthur D. Johns, Jr.,

# Notes for Your

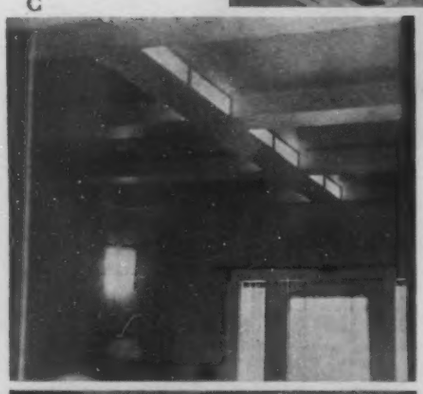
## A picture and a note or two bring you the heart of a lighting or installation idea you may be able to employ

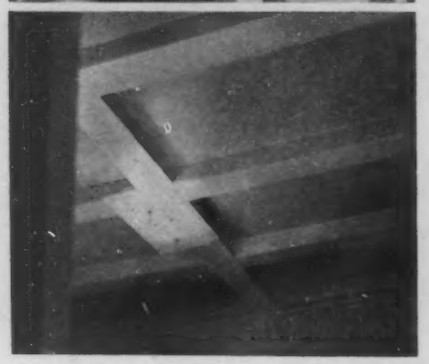
A—Modern drug stores are a little of everything, including restaurant, and need light to make merchandise invite itself to be bought. A brilliantly lighted chain drug store in Los Angeles uses combination fixtures that punch direct light downward on counters and displays, indirect light upward to make the entire room attractive. Note at left the hanging of fixtures over a decorative ventilating grill

B

B—Lumiline lamps concealed behind the valance over the windows make a logical general lighting arrangement in the home of F. M. Raymond, ad manager, San Diego Consolidated Gas & Electric Co. Thus light comes from the same general direction as daylight. Nine lumilines are used in the living room, supplemented by two I.E.S. floor lamps; six lumilines in the dining room. In all, Mr. Raymond uses 3,030 watts of lighting in a house of 1,700 sq. ft. floor area

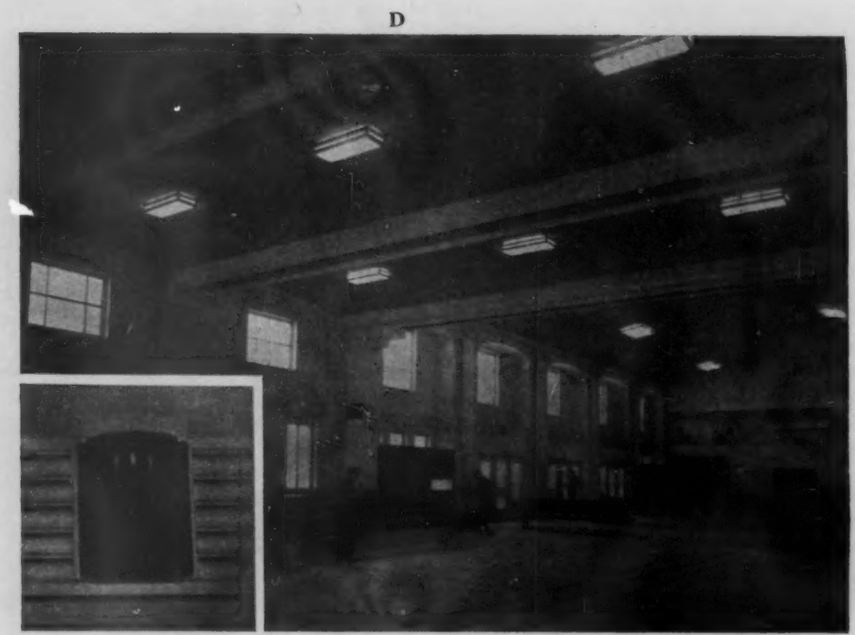
C





C—When the Cox (Electric Co.) family, at Red Bluff, Calif., remodeled an old house to live in themselves they introduced a novel lighting idea or two. The living room lighting comes from opal glass panels set into the ceiling beam, supplemented by decorative glass panels in each corner of the room. Over the dining room table is the flat glass plate shown at the bottom of the page, left

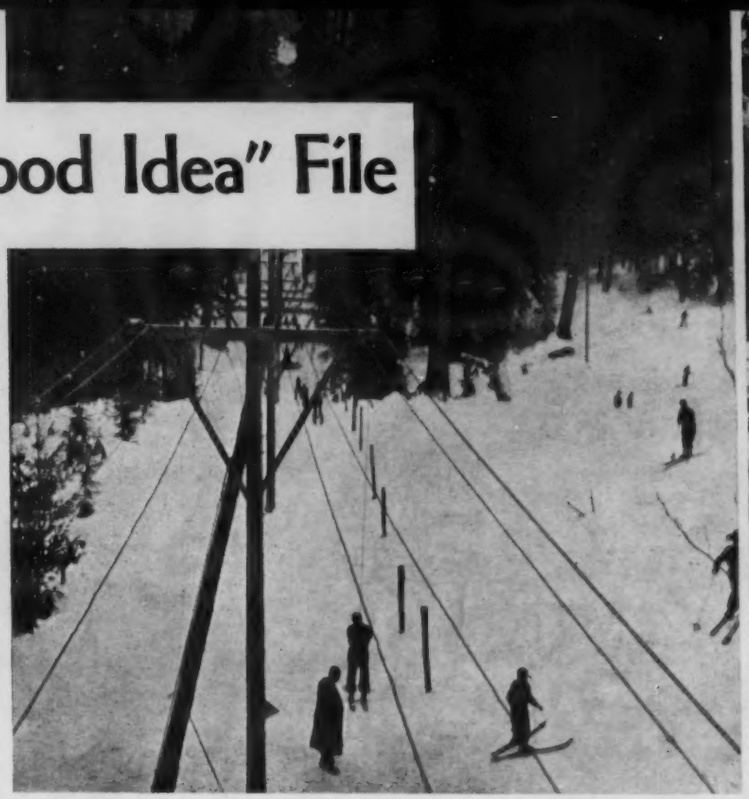
D





D—Competing with rail, bus and boat, Santa Fe Railroad made its new San Francisco bus depot exceedingly attractive. Alta Electric Co. installed ceiling boxes with three 200-watt Holophane lens units in each, producing 25 to 30 ft. candles at reading level. A public address system (inset) brings music to waiting patrons, or is used by the dispatcher to announce bus departures

# "Good Idea" File



Above — George Cooley (Electric Co.) of Seattle designed and installed this ski lift for Snoqualmie ski bowl. It is run by a 15 hp. vertical motor geared down to move the cable over the 12-ft. leather lined, 5-in. angle iron rimmed wheel sheave at 4.2 mi. per hr. Skiers hold on to ropes that dangle at intervals from a specially designed weighted hanger. Lighting permits night skiing, too

Right—May Co., Los Angeles, new streamlined Otis escalators can carry 8,000 persons per hour

Extreme right—Pacific Electric Motor Co. of Oakland relighted the Merco-Nordstrom Valve Co. plant with 500-watt high bay units plus Fostoria machine units for local lighting, thus stopping leaks in production the company would not permit of liquids flowing through its valves

Bottom—Combining direct, indirect, and outline or silhouette lighting, California Electric Works, San Diego, made this auto service station one of the community's brightest. Direct lighting for floodlighting, indirect for offices and workrooms, and silhouette lighting for signs may be seen in the picture

Burnaby, B. C., member of the electrical industry.

The indicator is a vertical tube of neon, red on one side and green on the other, which lights completely when the corresponding control light comes on. Then, as the interval progresses, the column of light shortens and finally goes out when the signal changes.

Mr. Johns claims that the complete installation, four units and a control box to an intersection, is cheaper than the present installation and reduces operation cost by 80 per cent.

The signal was recently demonstrated to Seattle authorities who have subsequently decided to try out several units.

# All-Electric Home

## Snow cabin owner gives electric living a boost

Public interest in the possibilities of all-electric homes is indicated by the experience of Dr. Ralph A. Reynolds, San Francisco physician, whose completely electric snow cabin near Soda Springs, Calif., has been the object of a flood of inquiries since a San Francisco newspaper published photographs of the cottage interior. (See cut.)

Dr. Reynolds' 6-room ski house is equipped with an electric range, automatic electric water heater, built-in electric heaters in every room, an electric ski-waxing device and all the usual appliances for preparing meals and doing household chores. After a day of skiing, Dr. Reynolds and his guests can have all the comforts of home by snapping a few switches.

First question asked by inquirers, according to Dr. Reynolds, is, "How much does it cost?" His reply: "It costs surprisingly little to operate all our electric conveniences, despite their number and the considerable use they get. Even during the record cold spell of last winter, when the heaters were going steadily, electric bills were amazingly low."

The Reynolds cabin was designed by Francis Lloyd, San Francisco architect. Electrical equipment was installed according to a plan devised by the doctor.

Electric cooking and water heating comes to the mountains

# Selling Wiring

## Adequate Wiring Bureau goes into action on all fronts

There can be no denying the fact that the National Adequate Wiring Bureau's newly launched attack on the bottle-neck of inadequate wiring is a significant undertaking. No stone has been left unturned in plotting the course of the nation-wide program. Which means that this is a merchandising drive of the first order.

Financed largely by the National Electrical Manufacturers' Assn., and jointly sponsored by the Bureau, the National Electrical Contractors' Assn., National Electrical Wholesalers' Assn., International Assn. of Electrical Leagues, Edison Electric Institute and the NEMA, the campaign parades the slogan, "Adequate Wiring — Serves and Saves."

As outlined in the plan book distributed last month by the Bureau, the program revolves round two related points: (1) Education of the public and (2) organization for sales by the electrical industry and allied industries. National headquarters will also concern itself with the supplementary points of inspiring local industry groups to organize to promote adequate wiring and of massing the interest and active help of employees in all branches of the industry.

So flexible is the program that any already organized local wiring association can tie in without upsetting its own general routine. This, for example, is exactly what the Electrical Development League of Southern California and the Rocky Mountain Electrical League are doing. Actually, therefore, the national program will serve largely as a common denominator for all local operations.

Education of the public as well as the industry takes a variety of tacks under the program. This promotional material includes: regular news services for both public and industry; a series of direct mail leaflets, a consumer booklet entitled "Copper in the Home" and another entitled "A Pictorial Primer on Adequate Wiring"; advertising mats; assistance in presenting local radio programs; sound-slide films for lectures; a folder interpreting in layman's language the residential section of the Handbook of Interior Wiring Design; posters and other display materials; package and payroll stuffers, and, above all, a 16-page digest of the residential section of the Handbook prepared specifically for architects.

Cooperation throughout the industry and in related industries is being pushed to the point of maximum efficiency. This is best brought forth in the plan book: "It is evident that the National Adequate Wiring Program can be of assistance to the Better Light—Better Sight activity, the Modern Kitchen program and others of similar character. It is also true that those activities can, in turn, be helpful to this program. The national headquarters will undertake to analyze the possibilities for whatever cooperation will result to mutual advantage and will offer definite and practical suggestions for the operation of the activities." Cooperation of employees of the electrical industry will receive equal attention.

No less important than the plan book is the certification plan book distrib-

uted only on request and describing those phases of the program which are applicable in communities undertaking a local program based on the certification of homes which are wired up to local adequate wiring standards (provided these standards are approved by the national bureau).

There are four basic elements in this plan: (1) A specification for local use approved by the bureau. (2) Issuance by the bureau of licenses to local leagues operating the certification plan. (3) Education of the public. (4) Local field service under which representatives will personally contact homeowners, inspect installations and see that certificates are awarded and identification emblems posted on the property.

●

# Print Shop Light

## A California newspaper comes to the aid of its printers

Newspaper shop composing rooms are notable for their prehistoric illumination. Latest exception to the rule, however, is the composing room of the Alhambra, Calif., *Post-Advocate*. In that plant, a modern lighting installation, designed by a Southern California Edison Co. illuminating engineer and completed by Ruebel Electric Co., Alhambra, provides from 30 to 60-ft. candles of soft, glare-free light on all "stones," proof-reading tables and a linotype machine. (See cut.)

Ten newly developed luminous "hoods" supply this light through flashed glass panels which reduce glare and shadows. General illumination has been increased to 10 to 20-ft. candles by the installation of twelve ceiling fixtures with scientifically designed reflectors.

●

# Shorts

## Dollars and cents; highway marking; wiring schools; etc.

HOW IT PAYS IN DOLLARS and cents to relight is told by Ted Shepard, illuminating engineer, Los Angeles Bureau of Power & Light. Cashiers and accountants in the Grand Central Market on Broadway formerly worked, in a room lighted by two 150-watt lamps in enclosing bowls, under illumination of 4 ft.-candles. Errors in tabulating the accounts were noted every evening. A new installation of four totally indirect 1500-watt reflectors was made. Now there is neither glare nor shadow and the illumination is at 40 to 50 ft.-candles. Mistakes in checking the cash have been eliminated almost entirely.

Making up pages under shadowless light

UNIFORM HIGHWAY MARKING and lighting is being sought by the engineering committee of the California State Traffic Commission. Committee members, appointed by various city administrations, will make a tour of selected cities with a view to promoting a uniform system of signs, signals, markings, and if possible, to determine the most satisfactory methods of illumination for streets and highways in the state.

●

WEEKLY WIREMEN'S SCHOOLS held at Boise, Payette, Pocatello and Twin Falls, Ida., this winter are, according to present plans, scheduled to start up again in November. The Boise and Payette schools were concluded by a dinner meeting Feb. 28; Pocatello and Twin Falls schools, late last month.

●

F. B. NIGHTINGALE, "the magician of light," is building a new studio, to be completed by late spring, in which over 100 of his own inventions in lighting equipment will be permanently installed. The studio will be used to promote garden lighting to consumers and to illustrate to wholesalers and dealers the possibilities of selling this equipment. Location is Mr. Nightingale's home at the north end of Canon Boulevard, Altadena, Calif.

●

SAN LUIS OBISPO COUNTY (Calif.) Tuberculosis Sanitarium is said to be the first heated institution of its kind. Completed by Cline Electric Co., San Luis Obispo, the installation makes use of 62 kw. of thermostatically controlled Wesix heaters in the main portion of the women's ward. Additional wing with 29 kw. of air heat is to be started immediately.

●

REPLACING the "Standards of School Lighting, 1932" is the new "American Recommended Practice of School Lighting," which has just been published. The book is sponsored by the Illuminating Engineering Society and the American Institute of Architects and approved by the American Standards Assn.

SHAMEL ELECTRIC CO., Los Angeles, installed 140-kw. of air heating, a Westinghouse range and a Thermador flat top water heater in a new grammar school at Cambria, Calif.

●

USE OF AMBER-GLOBED street lights to mark intersections when fog settles on Vancouver, B. C., will be abandoned in favor of black metal crosses on the exterior of ordinary white globes. Principal reason for the change lies in the fact that the amber lacquer now used to coat the inside of the globe reduces illumination by at least 40 per cent. Advantage of the metal strips, in addition to restoring almost the full intensity of light, is low cost.

●

CLINE ELECTRIC CO., San Luis Obispo, Calif., recently finished the rewiring of the Cambria Union High School, a $1,400 job including new lighting and panel boards. The old panel board, with 400 amp. capacity, was inadequate for heating. A new 600-amp. main power panel and a 400-amp. main lighting panel have been installed and provision is made for 200 amp. more.

●

SENT TO HOME BUILDERS by Lighting Fixture Industries of Southern California, an association of fixture manufacturers and distributors, are post cards suggesting the minimum allowance to be spent on lighting. Allowances, based on the cost of the house, are as follows: For residences up to $3,000, 2 per cent; from $3,000 to $5,000, 2½ per cent; from $5,000 to $10,000, 3 per cent; for those of greater cost, an increasing percentage.

●

UNDER CONSIDERATION by the executive committee of the Sight Conservation Council of Northern California is a plan of reorganization involving an ex officio and representative type of board of directors and three classes of membership. The plan will be submitted to all council members for consideration before the next general meeting May 3.

●

ELECTRICAL DEVELOPMENT LEAGUE of Southern California will hold a series of conferences for electrical contractors until every man has had an opportunity to attend.

●

IMPROVED STREET LIGHTING system was recommended by a Seattle inquest jury recently in fixing blame in the deaths of two pedestrians struck by automobiles.

●

INCANDESCENT LAMPS ranging from 75 to 500 watts were further reduced in price April 1. Average reduction was 17.3 per cent.

Prominent "maintainers" included, above, R. D. Coon, of Proctor & Gamble; S. H. Fish, electrical contractor; W. E. Coburn, Board of Education; and League Manager, F. L. Hockensmith and corncob

# Boulder Dam "Low Down" Learned

INSIDE stuff on Boulder Dam and power house was what the Electrical Maintenance Engineers Assn. of Southern California was after, and it got the real "low down" when two Pullman loads of its members excursioned from Los Angeles to Las Vegas and Boulder City last month. Into the deep internals of the power house, seldom seen by visitors, this electrically conscious group pried and peeked, asking the guides questions only the engineers could answer. Camera fans among them were numerous (O. K. Buck of the Los Angeles Bureau of Power and Light contributed many of the maps on this page), and the boat trip on Mead Lake after visiting the power house topped off the day scenically and photographically. V. J. Schmittroth, of Union Pacific, proved perfect host and trip arranger. Electrical Development League of Southern California assisted with preliminaries. A Boulder Dam fine time was had by all, including two attractive ladies magnetically inducted by the electrified engineers.

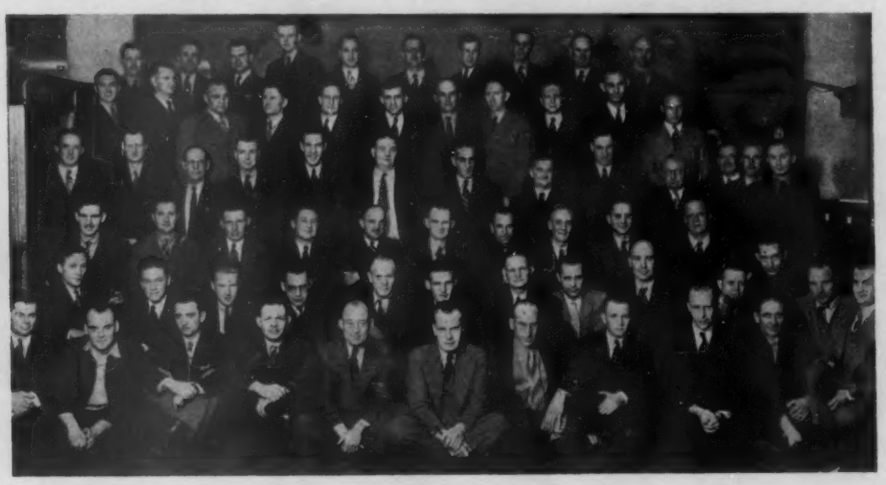
While below, left to right, are H. E. Easterbrook of Westinghouse; R. K. O.'s two cameradicts, Glenn Farr and Earl Miller; and H. S. Warren of Firestone, new president of E. M. E. A.

## Maintenance Men Study Industrial Electronics

Concluded late in February was a series of six meetings on industrial electronics sponsored by the Electrical Maintenance Engineers' Assn. of Southern California. The classes, each of which attracted a capacity audience of over 100 members of the association, were conducted by E. W. Morris, control engineer for Westinghouse Electric & Mfg. Co. and instructor of several previous couses on electronics.

Beginning with the fundamentals of the electronic theory, the course carried the students through discussions of amplifiers, grid controlled rectifiers, mercury rectifiers, ignitrons, phototubes and practical applications of electronic equipment. Each lecture was accompanied by demonstrations of the equipment discussed.

So decided was the success of the course that similar courses on various types of electrical equipment are being planned for the future.—*J. P. Logan.*



Electronics class lines up for its picture

# Departure

## Copco & Mountain States make changes in sales policies

Both California-Oregon Power Co. and Mountain States Power Co. are departing from their previous merchandising and sales policies. California-Oregon is making a gradual transition, Mountain States a more abrupt one from aggressive and intensive merchandising to a dealer sales program.

Glenn L. Jackson, vice-president and commercial manager of these Standard Gas & Electric affiliates, clearly defines his thinking in respect to the changes. Admitting that the previous merchandising policy employing the aggressive and thorough direct sales methods of the past left little opportunity to dealers, he declares that he had always made it plain to dealers in both territories that necessity for a high density of load, high saturation and high consumption on two power systems serving such scattered rural customers and small cities and towns, with virtually no industrial and only a little agricultural pumping load, dictated a strong selling drive, particularly on ranges and water heaters.

Having achieved an average annual domestic consumption of 2,118 kw.-hr. on the Copco system and of over 970 on the Mountain States system, Jackson feels that this pioneering has created a rich replacement market for dealers and has put electric cooking, water heating and refrigeration out in front of all other home-making methods.

Accordingly, on the Copco system, the company will continue to sell water heaters direct and ranges to new customers. It will likewise launch a strong program of dealer development so that dealers will definitely work on the large replacement market created by past years sales and the subsequent obsolescence of equipment. This program contemplates strengthening of dealer organizations, advertising and promotion, seasonal campaigns and sales direction. One of the most interesting phases is the fact that the utility will take in the traded-in electric ranges, recondition those that merit it, junk the remainder. The reconditioned ranges will be guaranteed and tagged or certified as used cars are, and the dealers will then sell them, principally to low-use customers who can't afford new equipment.

As the dealers develop their selling technique and assume more and more of the selling responsibility, Copco hopes gradually to withdraw from the direct sales picture.

On Mountain States lines, President Z. E. Merrill is desirous of an immediate and complete change. Consequently, all company stocks of appliances are being sold to the dealers in the territory and a program of dealer help is being developed. A limited sales staff will be retained to sell through the dealers. All former company salesmen have been placed in new positions. Dealer meetings are being held to acquaint all dealers of the new policies and to enlist them in a program of selling which will make unnecessary the reentry of the utility into direct merchandising.

Glenn L. Jackson, realist

The difference between the policies of the two companies, which have operated for several years under one management, will lie chiefly in what Jackson believes to be a sound procedure. The small towns, the widely scattered customers, the absence of heavy industrial loads are reflected in a scarcity of dealerships of any size or financial strength. At the present time they are unable to take over the full burden of loadbuilding.

By working with the appliance manufacturers, however, the utility hopes to strengthen the existing dealers and to provide outlets for other lines of manufacture among other dealerships. Unless this is accomplished and methods are worked out for producing the sales volume needed to maintain the saturation of appliances now attained and to build still higher use, Jackson feels that the entire industry will lose ground to now active competitive fuels.

High saturation of ranges also means high saturation of wiring for ranges. Thus the sales resistance caused by the cost of wiring is reduced and dealers are provided with a more easily sold market both for replacement of old ranges and sale of new.

# Future Campaigns

## Special drives scheduled for April, May and June

Following utility-dealer campaigns and special events have been scheduled for the next few months:

Arvada (Colo.) Electric Co.—This month, cooking school.

British Columbia Electric Railway Co.—Continued through May and June will be the spring range campaign, automatic storage water heater campaign, refrigerator campaign and the June Bride Gift Event. Special event for May is the President's Month Activity, a cooperative effort on the part of all employees toward building a large merchandise sales volume through company salesrooms.

Central Arizona Light & Power Co.—Automatic iron campaign for May; air conditioning equipment campaign for June. Backing up the June drive will be an air cooling equipment display. All activities are promoted expressly for dealers; the utility will do no direct selling.

Cheyenne Light, Fuel & Power Co.—This month, washer, ironer and refrigerator campaigns.

Colorado Central Power Co.—This month, range and refrigerator campaign.

Idaho Power Co.—Water heating and range campaign for May; water heating for June. Refrigerator shows will be held during May.

Los Angeles Bureau of Power & Light—Range campaign for May. Aluminum ware set valued at $14.25 will be given in exchange for old cooking equipment with each purchase.

Montana Power Co.—Cookery campaign for May; refrigerator and cookery campaign for June. Shows will be held in conjunction with dealers during both months.

Pacific Power & Light Co.—Refrigeration campaign for May; all-electric kitchen campaign for June.

Portland General Electric Co.—Range campaign in both May and June.

Public Service Co. of Colorado—For May and June, campaigns on IES lamps, Silvray fixtures and laundry equipment. During June there will be special promotion on small electric appliances for graduate and June bride gifts; also a tie-in with kitchen modernization program.

Puget Sound Power & Light Co.—Range and water heater campaign for May and June. A "Span of Life" essay contest in which utility, dealers, distributors and manufacturers are cooperating will be held in May.

Rocky Mountain Electrical League—This month, adequate wiring, refrigera-

tion and IES lamp campaigns.

San Joaquin Light & Power Corp. and Valley Electrical Supply Co.—For May, electric roaster, water heater and refrigerator campaigns; for June, range and small appliance campaigns. The companies are working out a coordinated industry campaign to tell customers that they get the best possible bargain from money spent with the electrical industry.

San Diego County Bureau of Radio & Electrical Appliances—Refrigeration campaign for May. June will witness intensive refrigeration advertising. A Spring Fair has been tentatively scheduled for May, but no date announced.

Southern Colorado Power Co.—Range campaign for May and June. A cooking school will be held in May.

Southwestern Public Service Co.—During this month, a dealer's appliance show and a tie-in with adequate wiring campaign.

Tacoma City Light—Special trade-in allowances will be given in May. A cooking school will be held in June.

Utah Power & Light Co. and Western Colorado Power Co.—For May and June, table appliance, water heating and air conditioning campaigns.

Washington Water Power Co.—Range and water heater campaign for May and June. This month the company is featuring modern kitchen cooking, water heaters, refrigerators and the fact that electricity is cheap all year.

Western Public Service Co.—This month, range and refrigerator campaigns.

Coast Counties Gas & Electric Co.—For May and June, campaigns on roasters, ranges and water heaters. Range demonstrations will be given before rural organizations in May and June.

Hawaiian Electric Co.—Company and its 28 cooperating major appliance dealers in Honolulu and environs will feature free range wiring in the May and June range campaign. The utility will advance a $25 wiring allowance to dealers on all range sales made during the period. In cases where the wiring exceeds that amount the dealers will absorb the difference.

Electric Appliance Society of Northern California and Pacific Gas and Electric Co.—Annual refrigerator campaign will be held from April 21 to May 21. Slogan is "The New Electric Refrigerator Pays for Itself and Then Pays You." Story to back up the slogan explains that 68c is saved weekly by preventing food losses; 50c weekly by buying food bargain specials; 62c weekly by buying in larger quantities; 73c weekly by reducing cost of refrigeration. Total thus saved is more than enough to meet monthly payments.

# Range Ideas

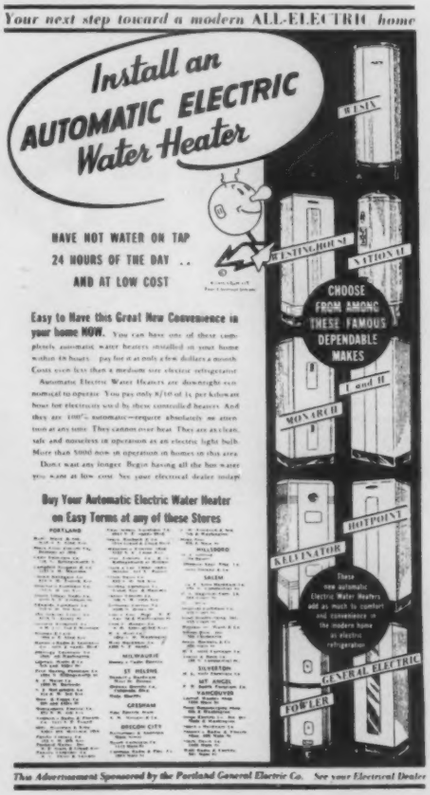
## How two utilities and a dealer service, sell and serve

Interesting experiment in range servicing is being carried on in San Bernardino, Calif., by Southern California Edison Co. Mailed to each range user is a double post card on which she is asked to note make and age of the range, units of the range not in operating condition and whether or not she would like to have a service man call.

First day's mailing of 50 cards resulted in response from five customers, replacement of fourteen burned-out coils. Subsequent mailings of a smaller number of cards (because it was found the service man could not make all the contacts required by 50-a-day mailings) showed about a 15 per cent return.

---

When a Los Angeles resident purchases an electric range, she receives, upon installation of the range, a letter from the Bureau of Power & Light congratulating her on her selection, explaining that a home economist will call in a few days to answer any questions and inclosing a folder giving suggestions on the care and operation of the range.


Your next step toward a modern ALL-ELECTRIC home
Install an AUTOMATIC ELECTRIC Water Heater
HAVE HOT WATER ON TAP 24 HOURS OF THE DAY .. AND AT LOW COST
Easy to Have this Great New Convenience in your home NOW.
Buy Your Automatic Electric Water Heater on Easy Terms at any of these Stores
CHOOSE FROM AMONG THESE FAMOUS DEPENDABLE MAKES
WESTINGHOUSE
NATIONAL
MONARCH
HOTPOINT
KELVINATOR
GENERAL ELECTRIC
FOWLER
This Advertisement Sponsored by the Portland General Electric Co. See your Electrical Dealer

Automatic electric water heater ad sponsored by Portland G.E. and listing advantages of electric water heaters, various makes and dealer stores

Latest wrinkle in the Bureau's letter, however, adds the final, and in some ways, smartest touch to the ingratiating service. Says the letter: "Enclosed you will find a small envelope with a gummed sticker giving the proper telephone numbers for you to call in case you should need information about its proper use before our home economist arrives, or in the event you should require range service. May I suggest that you place this sticker in a handy location for your future reference."

---

Although it is a comparatively new store, Ralph's Radio & Appliance Co., Provo, Utah, has already built up a large sales volume. Secret of the success lies in the words of Manager Ralph Wiscombe: "It's not enough to show a prospect a cold, white range, no matter how beautiful it is. Customers are more interested in steaming pots and the rich odors of foods being cooked."

By special arrangement, therefore, Mr. Wiscombe's prospects are taken to the home of Mrs. Charles Elliot, cooking demonstrator, where at certain hours on certain days the proof and the pudding are put before their eyes. Not only can an illustrated sales talk be given by the salesmen, but Mrs. Elliott also puts in a good word.

●

# Water Heating

## Portland G. E. puts new dealer program into operation

First drive to be launched under Portland General Electric Co.'s new dealer promotional program was an intensified cooperative sales effort to increase the popularity of electric water heating. Extending through April 9, the drive, which was sponsored by P.G.E., nine manufacturers and 70 dealers in Oregon, was publicly announced and explained to 300 dealers and salesmen at a meeting in Portland March 21.

Campaign features included three 60-in. advertisements per week in Portland newspapers (see cut); a window display contest, winners of which will be entered in the Modern Kitchen Bureau's national contest; campaign sales training classes limited to 20 dealer salesmen per conference; car cards, truck banners and store display material.

At the beginning of the campaign, P.G.E. had 5,000 automatic water heaters on its lines on an 8-mill off-peak rate. The sales effort was directed at the more than 35,000 range cusomers.

Under the new P.G.E. program the company retires from small appliance sales in practically all its territories

and limits its efforts on major appliances largely to promotional work. Salesmen, to be known now as "load-builders," will be compensated on sales made by dealers as well as on any direct sales.

●

# Ouch!

## City of Tacoma corrects our misstatement

Down on ELECTRICAL WEST's neck last month came a pained—and rightly so—Tacoma (Wash.) Dept. of Public Utilities. Wrote W. L. Gaffney, chairman of the Puget Sound Chapter, IAEI, and electrical inspector for the light division of Tacoma utilities:

"There is an article (in the March issue of ELECTRICAL WEST) headed "Hitting New Highs" to which I take exception. The article states that California-Oregon Power Co.'s average rate is 2.39c for residence consumption for 1936 and the only lower rate in the U. S. was Oregon Municipal Utilities'.

"The average kw.-hr. consumption is greater than ours, but Tacoma still leads the field in low average cost.

"In a paper I presented at the joint meeting of the Northwest and Southwest Sections of the IAEI at Salt Lake, I showed that our average for 1936 was 1,614 kw.-hr., equalling $26.77 or 1.66c per kw.-hr.

"1937 figures are now available and in my Salt Lake report I said we were looking for a 52,500,000 year in residence consumption. However, actual sales were 52,367,632 kw.-hr., which produced a revenue of $848,666.96, which gives the following averages: Kw.-hr. per customer—1,698; revenue per customer—$27.51; cost per kw.-hr.—1.62c.

"In September of 1936 a reduction in rates was put in effect which partially accounts for the lower cost per kw.-hr. over 1936."

No further argument forthcoming, ELECTRICAL WEST salutes the Tacoma department on its achievement.

●

# Selling Beauty

## P. G. & E. launches drive to spruce up San Francisco

San Francisco's need of beautification has always been pretty obvious. But in consideration of the fact that in 1939 the Golden Gate International Exposition will bring to the city millions of visitors and more millions of dollars, the need is much more acute. That, at least, is what a lot of civic-minded individuals and businesses are thinking.

No exception is Pacific Gas and Electric Co. P. G. & E. sees in a city beautification program a good way to produce more business for contractors, fixture dealers, cabinet makers, painters and, of course, itself. Consequently it has undertaken "The Cavalcades Are Coming in 1939" campaign, aimed directly at local retailers and built around a series of mailing pieces and follow-up calls.

## Los Angeles Plumbers Visit Boulder Dam

Results of the excursion made to Boulder Dam by 100 members of the Los Angeles Merchant Plumbers Assn. under the auspices of the Los Angeles Bureau of Power & Light were important to the electrical industry: Created in the plumbers was a new determination to sell electric water heaters and even electric ranges. In charge of the trip was Scott Johnston (left above), business agent for the plumbers association

For example: In February the company mailed to druggists a total of 350 letters. These letters brought in 18 requests for a copy of the company's lighting booklet. Not content with this, however, the company will follow up each of the 350 letters with personal sales activities.

In March, food dealers were similarly circularized. This month there will be another retail group covered and so on. September and October will, however, be the big months of the campaign, for at that time there will be a celebration of the anniversary of Edison's invention of the electric lamp.

According to R. G. Stevens, who heads up the campaign, a rough estimate of potential business to be had shows that approximately 8,000 business establishments in San Francisco need new fronts, lighting fixtures and painting. A survey of Market St. showed that within the past five years only 10 per cent of the stores between the Ferry Bldg. and the tunnel had modernized store fronts or improved lighting facilities. Of these, 80 per cent are within a district of five or six blocks.

To further the effect of the drive, P. G. & E. will also hold monthly meetings with electrical contractors, fixture dealer and cabinet makers to report progress and organize more intensive selling activity.

●

# Developing Business

## NEL&PA stages a big meeting in a small town

Even a "Mahatma Ghandi" train (Glenn L. Jackson called it that because "everything had been taken off that could be"), inclement weather and great traveling distance could not stop members of the Northwest Electric Light & Power Assn., Business Development Section, from turning out, 200 strong, to attend the 13th annual meeting in Medford, Ore., March 16-18.

Three idea-packed general sessions, a full day of parallel bureau and committee discussion sessions, well arranged and all-inclusive entertainment and even a final send-off by the town's fire sirens etched unforgettable memories of an occasion not soon to be surpassed in the minds of all who participated. Though Medford hotels overflowed to neighboring Ashland, the "small town" had put on a meeting. And the host, Glenn Jackson, vice-president of California Oregon Power Co., had been vindicated hands down: He had always said it could be done.

Dealers and contractors throughout the Northwest were considered, evaluated and finally marked down as valuable allies to the sales staffs of the utilities, the manufacturers and wholesalers who attended. There was scarcely a paper presented or discussed that did not point toward more business for the industry. Since the reports themselves are to be made a part of the proceedings of the association and printed in the June issue of ELECTRICAL WEST, detailed report of them will be omitted here. Rather, an outline of comments which lead to potential business and policy development will be reported.

Ralph Gale, commercial manager of Idaho Power Co. and section chairman, keynoted with the ideal of a higher perfection of customer service. W. C. Mainwaring, general sales manager of B. C. Electric Railway Co. and president of the association, echoed this thought, adding that, although saturation of appliances and services was high in the Northwest, "we have not

done a job yet." Even as the industry had sold itself out of the depression, it must sell itself out of the recession. One town in Washington with a 3,700 kw.-hr. average annual consumption per residential customer set an example of how much more potential use of electricity awaited selling, he said.

Parallel sessions of the residential sales bureau, the commercial and industrial sales bureau, the rural sales bureau and the advertising committee developed a number of valuable methods and many leads for business. The bureau and committee chairmen reported and summarized these meetings at the two final general sessions.

First called to report by Henry Kruse, Puget Sound Power & Light Co., chairman of the residential bureau, was E. E. Walker, B. C. Electric Railway Co.. chairman of home modernization. Walker's sessions had been lively, controversial, frank. Presented was a schedule of trade-in values, developed by one utility along lines similar to the automobile "blue book." By giving definite values to appliance merchandise the schedule stabilized this rankling competitive problem. Costs of selling appliances seem yet to be lacking, Walker said, and studies are necessary before merchandising methods can be evaluated properly. Old equipment, still in use but inefficient and slow, is a menace to new sales.

A 22- to 50-per-cent replacement volume is available to reselling. On trial plans, ranges seem to need no such stimulus. Water heaters, however, may need a trial in cases where "we have to live down a certain amount of indifferent service" given in the past. For this a 30-day period is suggested, though that involves installation cost; a 12-month rental purchase plan is to be preferred; dealer profit on such selling is questionable; sales training for dealers and salesmen in water heating is imperative and should be uniform.

Speaking of kitchen planning, he said: More coordination with other crafts and suppliers of equipment for kitchens is necessary. Home service girls should not be used as trouble shooters, but to contact and instruct new users. Space arrangement must not deprive the kitchen of its social function.

Whether a utility should or should not merchandise and how much is still a hotly debated subject. Many changes in policy during the past year have been made. The extremes—"those who shed everything" and those who completely ignore dealers—exist, and the happy medium with variations of degree also. When utilities withdraw from selling small appliances suffer and are relegated to the "screwdrivers and chisels and not properly displayed." Salesmen's compensation needs more study.

Dealers cooperation, everyone agreed, could be improved with profit to both parties. "The ideal situation," Walker declared, "would be that in which enthusiastic dealers might as well be members of the company's own staff."

Home service, reported Mrs. Edith Rauch, Puget Sound Power & Light Co., seems to be concerned with whether budget-trimming executives will consider the value of home service work at its full worth. More salesmindedness, active selling of appliances, development of sales through dealers, instructing prospects developed by salesmen were all discussed as necessities. Others, like Walter Potter, General Electric incandescent lamp department, reporting on the home lighting committee, hold that the goodwill value alone, even if it sells no merchandise or lighting direct, is the utility's greatest asset in public relations. Training home service girls, developing year round use of appliances, making newspaper cooking schools more productive and the importance of keeping existing customers sold on present use so that they will not reduce consumption in hard times were stressed.

A. H. Wegner's (Washington Water Power Co.) committees on commercial and industrial sales covered a wide front, though the absence of L. B. Gawan, Utah Power & Light Co., eliminated an air conditioning committee report. On D. A. Runyard's (California Oregon Power Co.) committee, O. C. Mayer, Idaho Power Co., made clear the distinction between the association's commercial cooking and baking committee, and the annual commercial cooking conference. The committee is organized for research and organization study and development of method, while the commercial cooking conference is held annually for the purpose of training and stimulating salesmen on the "firing line." A contest to encourage extra effort is to be run this year. Annual revenue and load from cooking grew from $200,000 and 8,000 kw. in 1936 to $300,000 and 15,000 kw. in 1937. "If you miss selling a lighting job," said Mayer, "you can come back next year or next month and perhaps sell it. But if you miss selling a commercial cooking job it may be 10 years before you have another chance with that customer." M. R. Lund, Washington Water Power Co., told of methods for developing more business.

Commercial and industrial lighting, Committee Chairman H. A. Olson, General Electric Co., Portland, reported, was still a major loadbuilder. Committeemen had reported on market possibilities still untouched, had listed the benefits to be derived by customers from modernized lighting. New lighting devices and lamp development, promising higher lumen output per watt and stronger color strength, especially from fluorescent lumiline lamps, had been shown by Walter Potter. Simplified written sales proposals had been found exceedingly effective, Wegner had reported, and other companies were interested in use of the same form. Solicitation of office lighting, particularly against the opposition of building owners, had been discussed. An idea to reach office managers through advertising lighting benefits to employees and thus having them ask their bosses for better light was suggested by a visitor from Calgary, Alta. School lighting, too, sometimes is best furthered when parents and children are awakened to conditions and rise to demand better seeing. To hold existing use, to prevent reduced use and to lay foundations for further use, Idaho power tested out its salesmen by listening to sales talks recorded while they made a presentation. Subtle changes to improve the message were possible by this analytical method. Sales tools for lighting salesmen were exhibited. More cooperation from contractors on lighting proposals is felt to be a serious need.

E. C. Branch, Puget Sound Power & Light Co., presented a resolution urging the preparation of uniform data sheets in industrial power and heating applications. Potentialities and problems attendant to electric power use had

Left—Glenn Jackson welcomes the Northwest Assn. to Medford; center—Edith Rauch and the home service girls have a session; right—Henry Kruse reports on the domestic sales bureau while Section Chairman Ralph Gale rests

been discussed in relation to water heating to produce steam for cleaning car motors, cooking sugar wafer shells, heating paraffin vats, curing tires, stereotype metal melting, etc. Solving paint spraying difficulties with electric heat proved a novel idea. But what worried power men most was the threat of new and efficient diesel engines.

Rural Sales Bureau Chairman W. R. Newmyer skipped technical subjects in reporting to the association. Instead he asked for support in budgeting of funds to bring the agricultural sales handbook up to date. His committees had covered the irrigation outlook in Oregon and had heard the "believe it or not" story of a region in Mountain States Power Co.'s territory where electric irrigation is used even though annual rainfall exceeds 72 in. Farm lighting, farm utility motors, sprinkler irrigation equipment, air movement for barns and special uses, fan ventilated brooders had also been covered. And Newmyer himself had told of sale of an air conditioning system to a poultry producer to assist in brooding chicks where a minimum output of 1000 broilers a month was required.

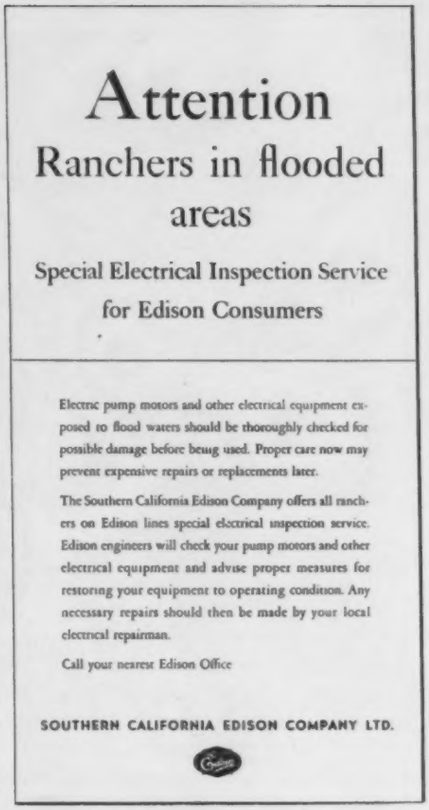
Advertising men, under chairman M. L. Cummings, Utah Power & Light Co., after hearing Glenn Jackson discuss the purposes behind his sales and advertising plans, concurred in his declaration that advertising, like other expenses, must show a return on the investment. Fast results; selective selling; aggressive advertising and sales follow up, and a study of incomes, standards of living, credit and other market factors had resulted in high appliance saturation and kw.-hr. use (2,118) on the Copco system, Jackson had said. Radio advertising had been thoroughly analyzed and appraised; water heater advertising appeals reviewed. Advertising rackets and the advertising department's responsibility to maintain good-will despite turndowns to seekers of advertising patronage had been warned of by James Lightbody, B. C. Electric Railway Co. Dealer coordination with advertising had much discussion. Recommendations from Mr. Cummings' committee were that more effort be made to merchandise company advertising to employees, that a systematic plan for interchange of advertising copy and ideas be developed and that radio advertising be used more, especially in small rural towns and communities.

Two addresses and two moving picture features completed the full program. Shown were Frigidaire's sales training film, "Selling America," and the Vocafilm, "Light on Power," an educational slide film designed for public relations meetings.

When Lewis A. McArthur, vice-president of Pacific Power & Light Co., could not appear to give his talk (see ELECTRICAL WEST, July, 1937, p. 19), on the relation of cost of electric equipment to utilization and of rates to use, D. B. Leonard, commercial manager, substituted for him. With charts he illustrated that low rates alone will not mean more usage, for in order to use electricity the customer must first invest in equipment.

George C. Tenney, editor of ELECTRICAL WEST, concluded the convention with a challenge to the leadership which had made the industry great in the past.

●


Attention
Ranchers in flooded areas
Special Electrical Inspection Service for Edison Consumers
Electric pump motors and other electrical equipment exposed to flood waters should be thoroughly checked for possible damage before being used. Proper care now may prevent expensive repairs or replacements later.
The Southern California Edison Company offers all ranchers on Edison lines special electrical inspection service. Edison engineers will check your pump motors and other electrical equipment and advise proper measures for restoring your equipment to operating condition. Any necessary repairs should then be made by your local electrical repairman.
Call your nearest Edison Office
SOUTHERN CALIFORNIA EDISON COMPANY LTD.

**Southern California Edison Co. sells a service. As soon as roads were open to traffic after the southern California flood, company inspectors were detailed to damaged territories to carry out the wording of this ad**

# Sales Shorts

## Bill; contest; model store; facts; guide; etc.

NEWLY PASSED WHEELER-LEA BILL gives the Federal Trade Commission the following rights: To issue complaints for any acts in commerce which it deems unfair and deceptive without waiting to prove, as formerly, their effect in competition; to issue a complaint without waiting for action to be initiated by an interested body; to act on any false, fraudulent or misleading advertising.

●

SPRING TRAINING CONTEST for appliance salesmen was started last month by Los Angeles Bureau of Power & Light. Ending May 21, the contest is divided into two sections, one for dealer range salesmen, the other for bureau appliance salesmen. Every salesman who sells a minimum of four ranges during the contest period is eligible for a prize. More than four sales mean a bigger prize. Awards consist of wearing apparel.

●

TO BUILD COMMERCIAL and industrial sales, Puget Sound Power & Light Co. recently presented throughout its territory a program, entitled "New Faces on Main Street," in which a model store about the size of an office desk was modernized before the eyes of the audience. The store, which started out as an old brick-front, badly lighted building, wound up with luminous lighting and a spotlight.

●

SALESMEN SHOULD HEED one of the facts brought out at Utah Power & Light Co.'s second annual sales conference: Customers of electric service do not concern themselves with the cost of electricity to any great extent until taught to do so by the salesman himself. Service should be sold, never kw.-hr. costs.

●

PUBLISHED FOR THE FIRST time by Pacific Gas and Electric Co. is a "Dealers Guide" book outlining the company's 1938 domestic sales plan. Included are objectives, policies and limitations of the plan, plus certain promotional ideas which are being carried out this year.

●

ALL-ELECTRIC COOKING SCHOOL said to be the first exclusively for men was held in Los Angeles late in February under the direction of Prudence Penny, home economics director of the *Examiner*, assisted by Leo Carillo, actor; Ben Blue, comedian; Gus Waser, Biltmore Hotel chef, and others. Attending were 1,500 persons.

●

CONSUMER CONTEST for all electrical dealers and utilities has been announced by International Nickel Co. and Whitehead Metals Products Co. With purchase by the participant of a Monel kitchen and background for showroom display, a duplicate set of kitchen equipment will be given free. This free kitchen is to be used as an award in the contest.

THREE CONTESTS HIGHLIGHT the Modern Kitchen Bureau's drive on electric water heaters. Two prizes of $500 each will be awarded to the utility executives or engineers submitting the best papers on the "Advisability of Competitive Water Heater Rate and Advantages of the Water Heater Load;" $460 in prizes will be awarded for the best letters from retail salesmen on "How I Sell Electric Water Heaters," and a silver trophy and $1000 cash prize will be awarded the operating utility doing the best all-round electric water heater job in 1938.

●

FAMILIAR DISPLAY ROOM maintained for many years by the Los Angeles Bureau of Power & Light in the basement of its main office building has virtually disappeared in favor of larger accounting and addressograph facilities. Plans contemplate the ultimate use of about half the main floor area for a new display room of modern kitchens and appliances. The employee sales room, now occupying a small basement space, will then be moved to the front of the basement.

THE FREEZE-UP —by Russell

"Joe and his 'atmosphere buildup' had better sell them pretty quick or we'll all freeze!"

SPRING EXPOSITIONS or pre-showings are to be held by four local leagues of the Rocky Mountain Electrical League: Albuquerque, N. M.; Rawlins, Wyo.; Casper, Wyo., and Denver. The Denver league featured refrigeration last month.

FIRST SERIES OF DEALER sales conferences, sponsored by the Electrical Development League of Southern California, is being held every Monday evening in the Los Angeles Chamber of Commerce Bldg.

## APPLIANCE SALES REPORT

A Summary of Dealer and Utility Reports Compiled by Associations, Societies, Bureaus, or Dealer Contact Departments of Utilities

| *February, 1938* | L. A. Bureau of P. & Lt.[1] | | Idaho Power Co.[2] | | P. G. & E. Co.[3] | | San Diego Cons. G. & E. Corp.[4] | | San Joaquin Lt. & P. Corp.[5] | | Southern Calif. Edison Co. Ltd.[6] | | Utah Power & Lt. Co.[7] | | Wash. Water Power Co.[8] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current | 2 Mos. | Current | 2 Mos. | ‡* Current | 1 Mo. | ‡ Current | 1 Mo. | Current | 2 Mos. | Current | 2 Mos. | ‡ Current | 1 Mo. | ‡ Current | 1 Mo. |
| Ranges | 333 | 733 | 189 | 311 | 220 | 220 | 35 | 35 | 103 | 202 | 225 | 522 | 157 | 157 | 91 | 91 |
| Water Heaters | 130 | 130 | 52 | 68 | 137 | 137 | 45 | 45 | 47 | 90 | 93 | 208 | 18 | 18 | 82 | 82 |
| Air Heaters, aux. | 121 | 327 | 36 | 124 | 1,261 | 1,261 | 250 | 250 | 35 | 95 | 196 | 444 | 157 | 157 | 159 | 159 |
| Air Heaters, 220 | 23 | 89 | | | 67 | 67 | | | 16 | 73 | | | | | | |
| Refrigerators | 1,392 | 1,392 | 165 | 317 | 1,717 | 1,717 | 300 | 300 | 290 | 503 | 1,430 | 2,840 | 207 | 207 | 212 | 212 |
| Dishwashers | 16 | 32 | | | 9 | 9 | | | 15 | 19 | | | 2 | 2 | 1 | 1 |
| Washers | 1,292 | 2,869 | 351 | 759 | 1,977 | 1,977 | 275 | 275 | 257 | 522 | 1,621 | 3,694 | 465 | 465 | 327 | 327 |
| Ironers | 218 | 503 | 60 | 115 | 355 | 355 | 45 | 45 | 43 | 106 | 231 | 524 | 30 | 30 | 25 | 25 |
| Vacuum Cleaners | 412 | 1,036 | 103 | 175 | 1,807 | 1,807 | 175 | 175 | 86 | 200 | 775 | 1,583 | 187 | 187 | 168 | 168 |
| Radios | 2,202 | 5,021 | 829 | 1,740 | 8,195 | 8,195 | 1,050 | 1,050 | 543 | 1,230 | 4,029 | 8,175 | 1,584 | 1,584 | 968 | 968 |
| Mixers | 125 | 311 | 35 | 111 | 304 | 304 | 75 | 75 | 36 | 73 | 206 | 497 | 217 | 217 | 138 | 138 |
| Cookers, Casseroles | 60 | 143 | 14 | 28 | | | 50 | 50 | 20 | 55 | 34 | 113 | 70 | 70 | 159 | 159 |
| Irons | 445 | 1,042 | 366 | 714 | | | 350 | 350 | 260 | 522 | 903 | 1,891 | 799 | 799 | 591 | 591 |
| Waffle Irons | 148 | 410 | 151 | 302 | | | 150 | 150 | 104 | 190 | 326 | 711 | 412 | 412 | 171 | 171 |
| Toasters | | | 188 | 356 | | | 250 | 250 | 90 | 211 | 450 | 1,036 | 447 | 447 | 333 | 333 |
| Table Stoves | 119 | 351 | 83 | 161 | | | 60 | 60 | 71 | 149 | 208 | 448 | 598 | 598 | 358 | 358 |
| Heating Pads | 122 | 403 | 55 | 142 | 200 | 200 | | | 45 | 112 | 228 | 550 | 231 | 231 | 178 | 178 |
| Curling Irons | | | | | | | | | | | 33 | 69 | 138 | 138 | | |
| Coffee Makers | 35 | 116 | 195 | 360 | | | 225 | 225 | 124 | | 258 | 582 | 332 | 332 | 300 | 300 |
| Sewing Machines | | | 8 | 19 | 680 | 680 | 65 | 65 | | | | | 98 | 98 | 53 | 53 |
| Clocks | 164 | 391 | 62 | 180 | | | 300 | 300 | 160 | 343 | 593 | 1,122 | 296 | 296 | 190 | 190 |
| Fans | 9 | 16 | 6 | 16 | | | | | 1 | 3 | | | 14 | 14 | 26 | 26 |
| Floor Polishers | | | | | | | | | | | | | | | | |
| Sun Lamps | 26 | 50 | 16 | 32 | | | | | | | 22 | 55 | 13 | 13 | 6 | 6 |
| Reflector Lamps | | | 230 | 445 | | | | | 118 | 210 | | | 935 | 935 | 1,585 | 1,585 |
| Miscellaneous Lamps | | | 532 | 818 | | | | | 201 | 334 | | | 803 | 803 | 599 | 599 |
| Yard Lights | | | | | | | | | 51 | 73 | | | | | | |
| Misc. Small Appl. | 252 | 459 | | | | | †700 | †700 | 123 | | 577 | 1,303 | | | | |

APPLIANCE

*Sources:*

[1] Compiled by Los Angeles Bureau of Power and Light for territory served by that system.
[2] Figures compiled by Electric Equipment Sales Association. Include power company sales and sales of all reporting dealers—about 60%.
[3] P. G. & E. reports sales of major appliances only based on accurate reports available from dealers' accounts. Ranges, water heaters and air heaters include company and dealer sales. * Lag of current and total figures is one month behind those figures reported in the other columns.
[4] Gathered by Bureau of Radio and Electric Appliances of San Diego County. Estimated monthly sales figures used in this table: Miscellaneous figure includes fans, curling irons and sun lamps.
[5] Includes dealer reports from Midland Counties Public Service Corporation also. Compiled by Valley Electrical Supply Company.
[6] Includes reports from dealers on San Joaquin Valley system of company as well as Southern California areas served.
[7] Includes Utah Power & Light Company territory in Utah, Idaho and Wyoming. Also Western Colorado Power Company territory.
[8] Dealer sales only for Spokane and company territory. Company sales not included. Table stoves, grills included with cookers.
†Under current month heading is shown previous month's figure. Lag of one month is also shown in total sales for year to date, which began December, 1936.
‡ February report was not available at time of going to press.

# ELECTRICAL WEST

# Appliance Sales Guide

Copyright 1938 by Electrical West, 883 Mission St., San Francisco All rights reserved including permission to reprint in whole or in part.

## You Can Beat "Hard Times" With Refrigerators

WHEN a man is up against it—he uses the old head— if he wants to get out of his fix. With sales at a low ebb, and customers jittery or reluctant to buy, there is no use denying that selling is harder today than it was last year. But by using the head instead of the chisel, a salesman with the well known intestinal fortitude can pit his brains against the sales resistances and come out way in front of the quitter, any time.

Electric refrigerators are ace cards of the appliance field—there are more reasons why folks should buy them in hard times than in good times. If prospects can be shown *why*, they will come to regard an electric refrigerator as indespensible to make their food money go farther. Strange as this may sound to them at first, let's see if this is so.

U. S. Dept. of labor estimates that 36 per cent of the average family income is spent for food. Of this 73 per cent goes for perishables, such as meats, dairy products, fruits, vegetables. (The latter is based on a national survey made by the California Fruit Growers Exchange.) The National Conference of Market and Farm Credits estimates that 20 per cent of all food purchased is wasted by *spoilage*. What do these add up to?

*Take a family* whose monthly income is $200. The average food cost would be around $40. With families of smaller income the food is proportionately higher. The two year food cost (two years during which the refrigerator would be purchased) comes to about $960.

Food spoilage would be materially reduced with an electric refrigerator. It is not reasonable to expect to save the entire 20 per cent by prevention of wasted food alone. In all there are about 7 ways in which definite savings can be made even with a minimum of thought and preparation. These are:

1. Quantity buying—larger sizes, etc.
2. Spoilage waste can be cut in half,
3. Food bargains can be stored until needed,
4. Expensive last minute shopping reduced,
5. Left-overs made into appetizing dishes,
6. Children's lunch spreads made up,
7. Home-made desserts at less cost

Certainly from these a saving of 20 per cent of the food cost can be made, even as a conservative estimate. Spread over this same two year period the food savings for this typical family can easily equal $192, enough to pay for a refrigerator suitable to the needs of such a family.

With this basic story a salesman can sell in spite of the business situation. Another thing is in his favor—

*If inflation comes the prospect will be better off to have a tangible, useful, expense saving refrigerator than money in the bank whose value may shrink. The value of the refrigerator does not shrink—it increases with use and knowledge of how to get more out of it.*

*More for the money today*—In every respect the prospect gets far greater value today for her money. The example in the table below is typical of the tremendous increases in value at greatly decreased costs within the past 10 years—from the boom days of 1928 even.

### More for their Money

Typical of increased value on all models—compare a 6 cu. ft. de luxe model for:

| 1928 | Average | 1938 |
|---|---|---|
| $350 | Price | $235 |
| $ 50 | Down payment | $ 23 |
| $ 55 | Carrying charge | $ 35 |
| $ 25 | Monthly payment | $ 8 |
| 24 | Months | 30 |
| $ 24 | Yearly cost of | $ 12 |
| Higher | operation rates | Lower |

**Plus These Additional Advantages**

More usable space
More accessible
More convenient
Higher efficiency
Lower operating cost
More silent
Less servicing
Faster freezing
More extra capacity
More dependable
Maintain lower temperatures
More beautiful
More ice capacity
More features—lights, sliding shelves, automatic defrosting, special trays and crispers, etc.

This little table, (applied specifically to several models on the sales floor) can be used to dramatize the bargain that today's buyer gets.

•

*Trade-ins*—Now that a high degree of saturation of electrical refrigerators has been attained, more and more the problem of a trade-in is involved in a sale. The automobile industry has already pioneered the rough road of trade-ins, and the electric refrigerator dealer and salesman can save himself the agony and headache of this problem if he profits from the auto industry experience. Out of that experience has come this suggested policy:

1. *Trade-in only after an examination of the old refrigerator.*

2. *Offer no more than can be recovered by the resale of the refrigerator, making due allowance for the cost of reconditioning.*

3. *Offer to take off the prospect's hands the refrigerator that is not worth reconditioning, and junk it so as to keep it out of the stream of trade.*

It is too easy to go broke on trade-ins, without such a policy. Wise dealers keep the reconditioned refrigerators away from the new. Some have a "bargain basement," or back "bargain room" or a warehouse store where low income prospects are invited to buy, just as used-car lots are employed.

One dealer has applied the "two car" or "two radio" idea to refrigerators. He convinces prospects of the advantage of ample food storage and urges the buying of the up-to-date new refrigerator for the kitchen. The old refrigerator he advocates be moved to the basement as a cold storage cabinet for storing large quantity purchases. This often solves a kitchen space problem too.

# . . . When the

## Is competition keen—then listen . . .

Thanks to salesmanship of the past, electric refrigertors enjoy better acceptance than most any other appliance. They should sell more easily, earn you more. A certain minimum volume may come without effort, yet with so many makes in the field, so actively promoted too, no dealer or salesman can afford to lean back and wait for sales to roll in. If the store down the street is aggressive it may attract from you your share of even this minimum business. You want more than minimum income, so that in turn you can enjoy better than minimum living. It **is** worth while selling.

Unfortunately nowadays refrigerator salesmanship has settled down to a competitive struggle over details of design and claims of lowest cost operation. The danger in this type of selling is that it raises doubts in the prospect, doubts that do nobody any good. Also the tendency is to forget to sell over and over the real basic reasons and appeals that cause a buyer to WANT a new refrigerator. Such real appeals are based on the **service** and **use** the customer will be able to enjoy as a result of a particular gadget or construction feature, not the mechanical detail itself. For instance—"sliding shelf" may not mean "convenience when taking food from the refrigerator, without spilling" to the prospect unless you actually tell her so.

Since virtually all makes of electric refrigerator now offer similar features and details, and all late models operate at practically the same new low costs, the salesman who tells only this half of his sales story needlessly handicaps himself. You will have an advantage over most of your competition, sell more, profit better, if you more thoroughly sell your prospect on the **complete** service and use, the real **advantages** to the customer, of electric refrigeration. It may be an old story to you, but part or even most of it may be new and vitally interesting to the buyer.

## To convert "No" into "Yes"

**keep telling your prospect that an electric refrigerator**

1. **Protects health** by protecting the family's food from decay and spoilage.
2. **Keeps food** sweet and appetizing for long periods. Preserves elusive vitamins in foods.
3. **Saves the left-overs** and provides an attractive way to re-serve them in jelly moulds, soups, etc.
4. **Saves in buying,** for extra quantities can be purchased often at better prices, and kept fresh until wanted in the refrigerator.
5. **Saves fuel,** for extra quantities can be cooked and kept to use in salads.
6. **Saves time** in the preparation of meals by storing previously prepared foods ready for a quick final cooking and serving.
7. **Makes entertaining easy,** for it provides ice for beverages, chills gelatins quickly, freezes desserts, and better yet, aids in getting a meal quickly for unexpected guests.
8. **Helps mothers** by making it easy for the children to help her, make up their own school lunches, fashion successful desserts and salads.
9. **Saves steps** and standing on the feet to prepare meals, for everything needed is kept close at hand.
10. **Provides plenty of cool drinks** and ices in hot summer weather; ice for sickroom use.
11. **Keeps ants** and dirt away from the food.
12. **Decorates** the kitchen because of its handsome, clean, well styled appearance.
13. **Avoids traffic** worries by making possible less trips to market; prevents losses from expensive last minute shopping.
14. **Builds pride** in the home, enhances its value, makes it more modern and livable.
15. **Is portable,** for it can be moved to a new home easily and with a minimum of trouble.
16. **Makes servants unnecessary** by cutting down the time to do kitchen tasks. Will not talk back, carry tales, take days off, etc.
17. **A unit of the all-electric kitchen,** it will fit into future plans for kitchen remodeling.

(Convert every feature, every gadget into its use-value.)

**CALIFORNIA OREGON POWER CO. • PORTLAND GENERAL ELECTRIC CO.**
**THE MONTANA POWER COMPANY • PUGET SOUND POWER & LIGHT CO.**

# Prospect Says: "NO"

**NO. 4B**
**REFRIGERATORS**

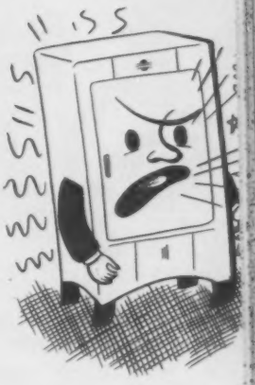
## Difficult resistances—How to meet them

**(out of the claims and counter claims of competition have sprung many destructive ideas that now come home to roost. When you meet such resitances, outsell them in this constructive way).**

1. **Cost too much** (either to buy or to operate) "Yes, I appreciate that cost is very important. That is why we feel that this electric refrigerator is such a long-time bargain. With it you can make everyday savings in the buying of foodstuffs, in keeping of leftovers, in serving them again in new and attractive ways. You can save on fuel by cooking larger quantities at one time and keeping the surplus for salads, soups, or jello moulds. These savings, many of my customers tell me, completely overbalance the original cost of the refrigerator. They say it makes it pay for itself, and then pay them. Improvements in the mechanism likewise have made electric refrigeration so inexpensive to operate that you really have a big dividend in your favor every month, to say nothing of the time and housekeeping it saves you."

2. **"Afraid of the refrigerant?** No one can blame you for being sure on this point. Someone is always trying to scare us, aren't they, and most of the time, upon investigation, we find that there is nothing to the bogey man, except perhaps a little personal interest. Aren't you inclined to think, too, that this has been greatly exaggerated? There are hundreds of electric refrigerators in this community, many of them several years old too, and yet there are so few cases of refrigerant leaks that I personally have never heard of one, have you? You see, the refrigerant is sealed inside; there are only about three pounds of it in any refrigerator, and it would take a great shock to cause even a tiny leak. In fact there is far more danger to you in tripping over rugs or walking across streets than you would find in a million refrigerators. Compared to the blessings it brings to our homes, the refrigerator is about the most useful, safest thing we use. Why it makes our everyday food safe, etc."

3. **"Service cost?** It is sensible to have a clear understanding on that point, I assure you. Through improvements in manufacturing methods, elimination of wearing parts, and more simplified machines, the factory has made this refrigerator as service free as possible. Then to give you double assurance, we have this guarantee plan (explain it). Now with this to reassure you, when you consider the protection to your food, the savings in time, etc."



4. **"Noisy?** That would be annoying, wouldn't it? I am glad you asked about it, for I am sure you will find this new model electric refrigerator extremely quiet. Don't you think, really, that perhaps a great deal more fuss is made over this than is warranted? When you consider some of the excellent services an electric refrigerator performs for you, that it is quieter, cleaner than you could ever get a servant to do it for you; that it goes about its job of keeping your food in tiptop condition, fresh, crisp, appetizing, safe from decay and bacteria, with scarcely a murmur, surely these are far more important to you. Nice thing about an electric refrigerator is that when you want it to freeze faster, it has that something extra in it that you can depend upon every time."

5. **"Someone told you** (some knocking remark) about this refrigerator? Yes, I am not surprised, although I always regret that anyone selling refrigerators should feel it necessary to do that sort of thing. However, you are a person of discrimination. Let me put it up to you to decide whether or not that statement has merit. Naturally I would feel that it does not have. Yet the real values in this refrigerator should speak for themselves, shouldn't they? What you want of it are such services as these: (Here recite the benefits to be had from the use of the refrigerator). Now to provide you with such services, the factory has built into this refrigerator these features (then go into your product details but as you describe each one, remind the prospect of the particular services to her that it will bring. Do not assume that she gets it automatically; perhaps she does not). As a still further assurance to you, there is the excellent reputation of the **(brand name)** over years of manufacture." (A judicious praise of the manufacturer will be more convincing than over doing it.)

6. **"Offered a better price on the** ——— refrigerator? Well, I couldn't well blame you for buying it from them, could I? That is, not unless I can show you services and qualities in our refrigerators here that will repay you well for the small additional investment. I am confident you are fair and will be willing to put it on that basis, won't you? Then let me show you why I feel you will get more than your money's worth with this refrigerator. (Proceed to give a thorough sales presentation, stressing services and advantages. The chances are in your favor if you give a more thorough demonstration.)

# Here's the Economy Story for Today's Hard Time Selling

## Time and Money Savings

### with a (brand name) Refrigerator

Besides the savings in buying you can make by taking advantage of large cans, instead of small, quantities instead of just enough for one meal, (which also save you shopping time) and savings in use of left-overs, there are many ways you can save time to devote to other activities by planning ahead a little and making your refrigerator help you with your work. For instance, here are but a few suggestions worth trying:

- When you buy fresh vegetables, prepare them for cooking all at once. Peas may be shelled, carrots scraped and cut, beans trimmed and cut, etc. and placed in covered dishes, all ready to put on the stove for a quickly prepared meal. You can come home late then and still get a fine meal ready in "no time."
- Save tops of vegetables and trimmings. Cook, mash or run through a colander, season, and put in jars as soup stock, or to flavor consomme, or to add to vegetables in place of water.
- Make up white sauce and keep in tight containers. This can be heated quickly for creamed soups or casserole dishes.
- Sandwich mixtures for school lunches can be made in advance and in a variety. Children can often prepare their own lunches if mother is ill or busy at other tasks. Cover jars securely.
- Prepare custard base for ice cream; keep in screw-top jars. You can go out to a bridge party or P.T.A. meeting and not have to worry about dessert for supper.
- Make waffle batter the night before. You won't need to rush so to get breakfast. To store—add half a teaspoon more baking powder than recipe calls for.

**full information—other money saving ideas**

at

Your Store

When your prospects are thinking most of economy, then your selling will be most effective if you prove that an electric refrigerator pays for itself and then pays the buyer dividends. Print up or mimeograph convincing proof taken from your own grocers. Get it up something like the example below. *(Be sure to get actual figures locally).*

## How You Can Save

with a

(brand name)

## Refrigerator

1. Quantity buying
2. No spoilage waste
3. Food bargains stored
4. No last minute buying
5. Use left-overs
6. Children's lunches
7. Homemade desserts

**Here are examples from last week's ads:**

**SAVINGS THROUGH PURCHASE OF LARGE SIZE CAN GOODS**

No 1 Can—16 ozs. No. 2½ Can—29 ozs.

| | | |
|---|---|---|
| **Apricots—Libby's** | **Peaches—Libby's** | **Del Monte Pumpkin** |
| No. 1 —15c | No. 1 —15c | No. 2 —10c |
| No. 2½—25c | No. 2½—2 for 45c | No. 2½—3 for 40c |
| Saving 9% | Saving—18% | Saving—8% |
| **Pineapple—Libby's** | **Libby's Spinach** | **Libby's Tomatoes** |
| No. 1 —14c | No. 1 —10c | No. 1 —2 for 25c |
| No. 2½—2 for 49c | No. 2½—2 for 29c | No. 2½—2 for 35c |
| Saving 4% | Saving—18% | Saving—22% |
| **Peas—Fancy Salt Air** | **Pears—Libby's** | |
| No. 1 —14c | No. 1 —15c | |
| No. 2½—24c | No. 2½—24½c. | |
| Savings 5% | Saving—10% | AVERAGE SAVING—11¾% |

**SAVINGS THROUGH QUANTITY PURCHASE OF VEGETABLES, ETTC.**

| Price on One | Quantity | Saving |
|---|---|---|
| 15c | 2 for 25c | 16-2/3% |
| 10c | 3 for 25c | 16-2/3% |
| 20c | 2 for 35c | 12-1/2% |

**SAVINGS THROUGH PURCHASE AT MID-WEEK OR SATURDAY SPECIAL PRICES**

| Regular Price per lb. | Special Price | Saving % | Special Price | Saving % |
|---|---|---|---|---|
| Meat 35c | 30c | 14% | 32c | 8% |
| Meat 30c | 25c | 16-2/3% | 27c | 10% |
| Meat 25c | 20c | 20% | 22c | 12% |
| Eggs 23c | 19c | 17% | 21c | 8% |
| Butter 34c | 30c | 11% | 31c | 9% |

**EXAMPLE OF SAVING ON CREAM**

1 qt. 18% Cream (4—½ pt. bottles at 15c).....60c per qt.
1 qt. 33% Cream (60c plus 1 qt. milk, 12c, 2 qts. 18% cream, cost 72c) or.....36c per qt.
Saving is 40% or 24c per qt.

| Item | Saturday Price | Week Day Price | % Savings |
|---|---|---|---|
| Wesson Oil | .33c | .40c | 17.5 |
| Dromedary Grapefruit (2s) | .11c | .15c | 26.6 |
| White Star Tuna (1/4s) | .09c | .12c | 25. |
| Libby Tomato Juice (talls) | .07½c | .10c | 25. |
| Libby Salmon (1s tall) | .15c | .19c | 21. |
| Tomatoes in Puree | .07½c | .10c | 25. |
| Jone's Hams | .14c | .17c | 17.6 |
| Lettuce | .02½c | .04c | 37.5 |
| Avocados | .12½c | .20c | 37.5 |
| Lemons | .24c doz. | .30c doz. | 20. |
| Mild Cheese | .12c lb. | .17c lb. | 29.4 |
| Tillamook Cheese | .16c lb. | .20c lb. | 20. |
| Swift's Wieners | .12½c lb. | .15c lb. | 16.6 |
| Brookfield Cheese | .12½c | .15c | 16.6 |
| Fresh Salmon | .07½c lb. | .10c lb. | 25. |
| Fresh Young Hens | .15c lb. | .17c lb. | 11.7 |
| | AVERAGE SAVING | | .....23.1% |

Your Store Name

You will make more sales through your existing users if you follow up with *service* information on how they can get the most out of their refrigerators, in return for which they will give you leads to new prospects. The above information, printed or mimeographed, can be handed to your former customers as a reason for a call-back. It can also be used to prove to prospects who are hesitant about buying that the *uses*, the *services*, the *savings* of *time* and *money* possible with an electric refrigerator make it an investment that keeps paying them back every day.

In your newspaper advertising the mats and ads that manufacturers provide are excellent. To supplement them with ads of a more personal local flavor use the 17 sales points inside this Guide as suggested in the last month's Guide on ranges. The ideas on this page are best for personal distribution by the salesman to the prospect, with local figures.

# Travels & Talks

## PCEA leaders complete convention circuit

When the gavel had fallen to close the Watsonville meeting of the Pacific Coast Electrical Assn., Feb. 25, President R. M. Alvord and a staunch troupe of traveling conventioners, folded their speeches and made plans for the next event, the spring conclave of the P.C.E.A. at Fresno, April 7 and 8. February proved a busy month of traveling conventions. The first one, in Sacramento, in December, set the pattern others followed with few variations. In purpose the conventions were conceived to report to the industry, in all branches, the activities and program the P.C.E.A. committees have set for themselves this year, and to carry this message as much as possible to the membership through a series of meetings near their homes.

San Bernardino was the site of the second meeting, Jan. 21, with an attendance of 183. Next came one in Bakersfield, Jan. 31, with 233 in attendance, a third in San Diego, Feb. 16, attendance 111, and the final one in Watsonville, with attendance of over 300.

Except in San Diego, Dr. Paul Cadman, noted economist and former dean of men, University of California, was the principal speaker. In San Diego Byron Hanna, attorney and former president of the Los Angeles chamber of Commerce spoke. Dr. Cadman's message was one of sensible advice and inspiration. Everyone, these days, he said, seeks security. Then he demonstrated that the only real security comes from creating services or wealth in surplus that can pay an increment in a more secure future. Security, he showed, cannot be merely legislated, it must be acquired. And the electrical industry, progressive and still reaching into new markets, offers those engaged in it the best guarantee of security of any business today. Mr. Hanna's talk was similar in spirit. He made a more matter of fact presentation of the achievements of the electrical industry within a lifetime, from the viewpoint of an outsider, building a pride in being connected with so constructive and progressive a business.

In each case but one, Mr. Alvord opened the meeting with an outline of the purposes of the P.C.E.A., of its new policy of more completely representing the entire industry. In Bakersfield Stanley Scarfe read Mr. Alvord's paper, and H. C. Rice, who outlined the activities of the Business Development Section, as its chairman, gave the talk on adequate wiring usually given by Victor Hartley, managing director. Arthur Kempston gave the wiring talk in Santa Cruz. D. D. Smalley, chairman of the Operating Economics Section) not only told of the program of his section but of that of the Administrative Services Section as well.

Local men in charge of the meetings were: San Bernardino—Albert Cage, vice-president, Nevada-California Electric Corp., chairman; H. J. Moulton, Southern California Edison Co., and Robert Neuman, Nevada - California Electric.

Sacramento—L. J. Brundige, P. G. & E., chairman, and J. O. Tobey, P. G. & E.

San Diego — L. M. Klauber, San Diego Consolidated Gas & Electric Co., chairman; G. H. P. Dellman and F. M. Raymond, San Diego Consolidated; J. Clark Chamberlain, San Diego County Bureau of Radio & Electrical Appliances, and Archie Marsden, San Diego Electric Club.

Bakersfield—H. K. Fox, San Joaquin Light & Power Corp., chairman, and M. W. Phillips, Southern California Edison.

Watsonville — Frank S. Thomas, Coast Counties Gas & Electric Co., chairman; P. S. George and J. S. C. Ross, P. G. & E.; J. A. Schanbacher, Watsonville electrical contractor, and Frank Carroll, Santa Cruz electrical contractor.

●

# Vancouver Session

## NEL&PA engineers to meet

Northwest engineers will gather in British Columbia this month, when the Operating Economics Section of the Northwest Electric Light & Power Assn. will hold its annual meeting. The group will convene in Vancouver, April 20-23. A. Vilstrup, chief engineer of the British Columbia Electric Railway Co., is section chairman.

Wednesday, April 20, will be given over to programs of the Accident Prevention and the Electrical Equipment committees. Power Production and Utilization will take the stage Thursday, and Code Committee and Transmission & Distribution, Friday. The annual dinner will be Friday night.

Inspection trips to the Ruskin and Stave Falls developments of the B. C. Electric Railway Co. are scheduled for Saturday. This is the first meeting of this Section to be held in British Columbia and 100 to 125 delegates are expected to attend.

●

ANNUAL CONVENTION of the Southwestern Section, IAEI, will be held in Long Beach, Calif., Oct. 10-12.

# PCEA Convention

## Preparations are being made for San Francisco meeting

Each of the three sections of the Pacific Coast Electrical Assn. will sponsor a general session at the association's annual convention at Hotel Fairmont, San Francisco, May 26-27. Plans for the convention, now being developed by President R. M. Alvord and General Convention Chairman Stanley Scarfe, may possibly include a public meeting for invited guests.

The convention itself will open Thursday morning with a general session. A group luncheon Thursday will be addressed by an outstanding personality in the business world. After Friday morning's session the afternoon will be open for golf and sightseeing. A dinner-dance and entertainment will climax the meeting.

As now planned, none of the sessions will be crowded with speakers or events, the purpose being rather that of providing a vital and interesting program without boring those who attend. In as many cases as possible the presentations will be illustrated, dramatized or of such importance as to attract maximum attention.

President Alvord's major purpose, that of bringing about a better coordination and understanding between the various branches of the industry, will materially shape the type of program. Earl N. Peak, president of the National Electrical Contractors Assn., will, for example, present the contractor viewpoint. Similar expressions from other groups in the industry are being sought out. A nice balance of business, engineering, administrative, policy and trade relations topics and treatment is being developed by the convention committees.

●

# Budget & Dues

## NECA branch takes action

Budget of $5,300 plus 1 per cent of the productive payroll assessments has been voted as a means of paying monthly dues of the Los Angeles branch, Southern California Chapter, National Electrical Contractors' Assn. Action, taken at the Feb. 28 meeting, coincided with the appointment of R. R. Jones as chairman of the membership committee and E. J. Bennett as chairman of the program and entertainment committee, and adoption of a resolution against the Revenue Bond Act of 1937.

J. J. Campbell, coordinator, and L. J. Ryan, chief auditor of the state Sales Tax Division, spoke at the March 14 meeting.

# EDITORIAL

## What Do You Maintain?

ON the San Francisco-Oakland bay bridge are two dozen painters. Lately they've been somewhat hampered by the rain, but ordinarily they just paint and paint, day after day. When they've finished the last beam and cable, the beam and cable they started in with are ready to be painted again. And so on. Their job is eternal.

Our physical assets have ways of reminding us that the job of maintenance goes on day after day —changes in color and texture, appearance of small failures here and there. But although we have learned the value of our intangibles—like public esteem—few have learned to read the signs of their decay. There are no obvious reminders that without vigilance, goodwill value can dwindle unnoticed past the point where it may easily be restored.

Like those painters, hasn't each of us a job that is eternal?

## Soldiers of the Storm

GREAT has been the burden placed upon Western utility systems during recent weeks by unruly and perverse weather gods. And heroic has been the response of the men whose work it is to maintain service. Wind, water and ice have not only tested the metal of these systems but they have also tried the spirit of thousands of men. For their courageous work ELECTRICAL WEST salutes these soldiers of the storm in the knowledge that this public recognition, though well merited, is but a meager tribute to the services they performed. We can pay them no greater homage than to repeat the public acknowledgment of one utility executive whose understanding of human relations prompted this statement:

"The storm broke early this week and continued for days. Soon the roads became blocked; then the telephone lines went down . . . trains were stalled . . . airplanes were grounded. For all practical purposes towns were isolated. But the battle went on. What kept those linemen on the job without food or sleep for many long intervals? It wasn't wages . . . you can't pay for such effort . . . it was just plain love of the game . . . just fighting spirit . . . company spirit . . . that kept them at it. They stormed into the fight, beaten from the pole lines by a seventy-mile gale of sleet, trying again and again, lashing themselves to the structures, wallowing through impossible drifts to the point of exhaustion, thrust back repeatedly but never whipped . . . damning the skies, the tools, the wind, the snow, the country, the company, soaking wet or frozen stiff, grousing like soldiers in a front line trench. There was trouble to spare during those many days; lines went down, were repaired, went down again and were repaired again. Yes, there was trouble enough to go around and everybody knew where to find plenty and went out to get their share. Swearing? Sure . . . Mad? Clean through . . . who but a moron or a fool giggles at a blizzard in the High Sierras . . . but happy? Every last one of them, and fighting with all they had."

Yes, we who sit inside taking for granted the service which is ours at the flip of a switch, salute the soldiers of the storm.

## Uncovering the Facts

OUT of the Morgan vs. Morgan-Lilienthal-Roosevelt controversy may come one major fact of interest to the electrical industry. A Congressional investigation should reveal the true length of TVA's rubber yardstick. This loudly hailed gage of electric rate may conceivably snap right back in the faces of those who expected it to create an industrial and social revolution in the Tennessee Valley. Under the spotlight of a factual investigation the TVA quarrel might be relegated into the background by disclosures of more serious importance.

The investigation has been needed, not to determine the integrity and business judgment of officials, but to reveal whether the TVA project as a whole promises ever to deliver benefits commensurate with the investment. It is needed to clarify certain fundamental issues. These have been stated by one nationally known commentator as involving the question of whether "the new instruments for power which the administration has created for social purposes shall be administered for clearly defined objectives, or whether they shall be used as political instruments for the aggrandizement of further undefined power; whether they shall be administered for the purposes designed or for the punitive purposes of fanatical partisans; whether they shall be used to advance a social order based upon principles of fair play, equal justice and scrupulous public accounting, or whether they shall be used to accomplish a social revolution according to the unclear pattern of a few internal schemers."

Those who have felt that the TVA has engaged in practices which, used by a private organization, would bring immediate government censure and condemnation have long hoped for a full public

survey of its operations, methods and accomplishments. When the light is turned on, the power phases of the project should be revealed for what they are—a subsidized undertaking with a balance sheet splashed with red ink.

## *Unselling the Next Generation?*

A DIRECTOR of home economics in the schools of a Western city is thoroughly sold on use of modern equipment in domestic science classes of the public schools. Through her influence electric ranges were selected for installation when a new school was erected recently. All this sounds very progressive and satisfactory from the standpoint of the electrical industry—but here is another side of the story.

Through some fault of the contractor, manufacturer or power company, the installation proved unsatisfactory. Obsolete or too cheap ranges were used and the wiring was skimped so that even the elements did not heat properly. The installation was taken out and replaced at considerable expense—and still the ranges do not give good service.

Reasons for the particular failure have not been personally investigated—they may be the result of graft or incompetence or some other uncontrollable condition—but the effects ELECTRICAL WEST does know.

There are several domestic science teachers in the schools of this community. Each is learning by experience, however unjustly, to advise against the use of electric equipment in the kitchen. Some 250 children have used the faulty stoves and have reported their disgust at home. It will not be many years before these same girls are running homes of their own. They will have to make a choice of cooking and other household equipment they want to use. Then there is the director herself, who is fast becoming impatient and whose fine attitude toward modern improvements is dwindling to a somewhat skeptical disbelief. And there is the board of educaton, which is tired of the whole story and has recently refused to sanction purchase of electric refrigerators and washing machines because of the whole unsatisfactory experience. There are four more schools to be built or remodeled in this community in the near future.

In how many communities is this neglect going on? Is it not time that every school be investigated for such destructive conditions? Here is a situation that calls for action, not excuses or alibi or shifting of blame. Future survival of the business depends upon correction of sales resistance at its very source, among the housewives of tomorrow who are being prejudiced today.

**ELECTRICAL WEST**

DEVOTED TO THE ECONOMIC PRODUCTION, TRANSMISSION AND DISTRIBUTION OF ELECTRIC POWER AND ITS APPLICATION TO INDUSTRY, COMMERCE, AGRICULTURE AND HOME IN THE PACIFIC EMPIRE, AND TO THE MARKETING OF EQUIPMENT AND APPLIANCES AND OTHER UTILIZATION DEVICES IN THAT AREA

## *Digging in*

IF there was one impression stronger than any of the many which those who attended the meeting of the Business Development Section of the Northwest Electric Light and Power Assn. carried home, it must have been this: Selling technique, used to build load during the past few years, is now to be used to keep that same load sold. The utilities are digging in to hold the gains made during the fitful days of partial recovery.

Such a procedure is sensible. When the last depression hit, it caught this young and inexperienced industry unprepared. Its growth during the two decades preceding had been so phenomenal that it was unused to a condition wherein demand for service did not exceed the supply. In some cases it beat a poor retreat; in others there was a loss of manpower from which the industry later suffered.

To meet the present depression a wiser course is being taken, if the reports and discussions at the Medford meeting last month indicate the trend. The sales forces of a number of utilities are being groomed to do a new kind of selling job. When it was first attempted the salesman floundered somewhat like fish out of water. Familiar as they were with straight selling, they were unused to reselling, to laying foundations for future sales. But soon the new technique was developed.

Present customers are the recipients of this new sales approach. Each of them is contacted frequently. The purpose of the contacts is to (1) check to see whether the service rendered has been satisfactory, (2) show the user that his electricity is probably the cheapest of all his necessities and that (3) it would not profit him to reduce his usage; (4) indeed as soon as possible he should increase it because new usage would come on the lowest step of his rate.

With such a program there should be no retreat. The trained manpower of the selling organization will be gainfully employed. What is best is that the way will have been paved for increased load at the first sign of upturn. Such digging in will hold the hard-won gains of the last few years, gains so urgently needed since rate reductions have reduced revenues.

# NEWS OF THE INDUSTRY

## ROSS SEEKS OPINIONS ON BONNEVILLE RATES

Bonneville Administrator J. D. Ross traveled on many trains and climbed on many stumps last month in an effort to prove that the Northwest needs a vast, inter-connected power system and to find out approximately what ultimate consumers want in the way of rates. Accompanying him were Claude L. Draper, Federal Power Commissioner, and Lesher Wing, regional director of the FPC.

Speaking at key points throughout Oregon, Washington and Idaho, Ross let it be known:

That Bonneville power must be carried to Idaho in order to make available the state's five billion tons of phosphates.

That "we will construct a 220,000-volt line from the dam to Portland and Vancouver, Wash., and 110,000-volt lines north to Kelso, Wash., and south to Salem, Ore. The House has passed a bill to give us $3,500,000 to construct the lines, and the Senate will pass it soon. The lines could be completed within a year."

That a line is also planned to The Dalles, Ore.

That a 20-mi. test line, carrying direct current only, will be run north from Bonneville this summer as an experiment.

That he would ask the Dept. of War to install two more generators at the dam.

That he has transmitted to the FPC his ideas on the proper industrial rate to be charged at the dam. And that he expects to figure out the rate schedule in a few weeks.

What rates the consumers want were, however, unannounced. Those few interested persons who assembled to hear Ross could reach no agreement on whether they should be charged "postage stamp" (blanket) or zone rates.

---

A GRAND COULEE COMMERCIAL CLUB committee last month advised J. D. Ross that the Grand Coulee construction and adjacent townsites could consume 300,000,000 kw.-hr. of Bonneville power.

---

E. J. KELLER, chairman of the Washington Bonneville Commission, resigned last month. Decrying Ross' policies, he said it would be "futile to oppose what appeared to be a cut-and-dried plan to apply postage stamp rates on Bonneville power."

FIRE OF UNKNOWN ORIGIN partially destroyed Utah Power & Light Co.'s Green River, Wyo., power plant late in February. Damage was estimated between $30,000 and $40,000.

---

## SUPREME COURT RULING CLARIFIES UTILITY RIGHTS

Hastily conceived headlines following the Supreme Court decision requiring registration under the Public Utility Holding Company law last month gave many readers the impression that the utilities had "lost."

As some observers discerned, what the utilities prudently sought was authoritative assurance that their registering did not necessarily mean they considered other parts of the law constitutional. Such assurance was contained in the majority (6 to 1) opinion by Chief Justice Hughes:

"All rights and remedies as to all other provisions of the act are . . . expressly reserved to the defendants . . . (this decree) will constitute a specific adjudication that registration will be without prejudice to future challenge of the validity of any provision of the act, or requirement of the commission outside of Sections 4A and 5 (registration provisions)."

---

## WESTERN SYSTEMS MAINTAIN BIG EXPANSION PROGRAMS

Scarcely affected by the current business decline are construction programs of Far Western electric systems. Even if business goes from bad to worse so that utility programs are pared to the bone the 28 private and municipal electric systems having 81.8 per cent of all generating capacity in the eleven Western States will spend $72,568,000 for plant additions and improvements this year, a 16.3-per-cent increase over 1937.

Such, at the close of the first quarter, were direct reports from the systems.

Three systems have increased their original estimates, two have decreased them, the net being an increase of $357,000 over January estimates. Four are with-holding $3,222,000 worth of construction pending business developments. If some of this is spent, the $72,568,000 will be increased, may reach $75,790,000, a 21.3-per-cent increase over plant expansions in 1937.

## CALIFORNIA, UTAH STORM LOSS SURPRISINGLY LOW

In comparison with the unequalled severity of the storms which harrassed southern California and Utah last month, damage to utility companies was remarkably small. Greatest loss, amounting to roughly $400,000, was that reported by Southern California Edison Co.

Los Angeles Bureau of Power & Light counted a loss of approximately $90,000; Nevada-California Electric Corp. and Utah Power & Light Co. suffered similar losses.

Despite the extent of the damage, complete service was restored by all utilities within four days at the outside.

No system-wide interruption was experienced by Southern California Edison. Breaks were local in character and confined to a small percentage of the system. In the majority of cases these were the result of washed-out poles and towers, although several were caused by falling trees. Most severe interruptions were to the Riverside and Pedley substations, all lines to which were washed out when the Santa Ana River changed its course.

Los Angeles Bureau's damage was limited largely to three towers on two of its transmission systems and isolated distribution poles and wires. The storm marked the first time in 22 years of operation that the bureau was obliged to drop a portion of its load because of insufficient capacity. And when the Boulder and Aqueduct transmission lines were put out of commission, it marked the first time that the bureau was dependent 100 per cent on steam generated power.

Nevada-California's biggest trouble came March 2, when the high line from Bishop, the Boulder line and the company's lines to the Coachella and Imperial Valleys all went out. However, through use of the San Bernardino steam plant, which had not been run for two years, and through the assistance of the Edison company (which also supplied the Bureau of Power & Light with 63,000 kw.) and San Diego Consolidated Gas & Electric Co. service was maintained on most fronts.

Also hit by the storm were the communications systems. During the height of the storm, Los Angeles and surrounding territory was virtually isolated.

The disaster was not without its benefits to the electric utilities, however. When the gas supply to San Bernardino and Riverside Counties and other lo-

# Only .002" cylinder wear in MAMMOTH DIESEL

## After 3,648 hours with SHELL LUBRICANTS!

IN 1935, the Carthage, Missouri, Water and Electric Plant found that its three Diesel engines no longer had sufficient generating capacity to meet the city's growing requirements for light and power. They went to the Nordberg Manufacturing Company with their problem.

As a result, the Board of Public Works of the City of Carthage contracted with Nordberg for one of their new model 2,250-horsepower TS-216's then being developed and tested in the Milwaukee factory.

With the first development of this enormous new Diesel, Shell engineers closely analyzed its lubrication requirements—called on Shell's wide resources and experience to find the ideal lubricant. Exhaustive block tests proved the exceptional performance of Shell Talpa Lubricating Oils. The new Diesel engine was placed in operation in Carthage, its pistons cooled, its bearings and cylinders lubricated by Shell products—100%.

For 3,648 hours this new Diesel engine ran continuously at the Carthage plant. Then the big engine was stopped and its pistons were pulled for inspection.

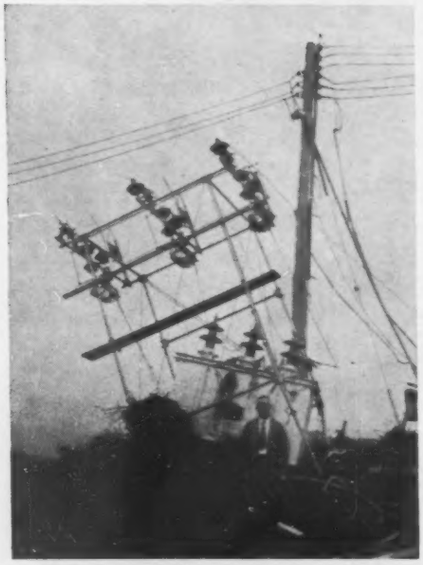
All oil rings and ring grooves were found to be mechanically free and without a trace of deposits. Most remarkable, after 3,648 hours of operation, cylinder wear was found to be less than .002 of an inch—almost unheard of in an engine of this size!

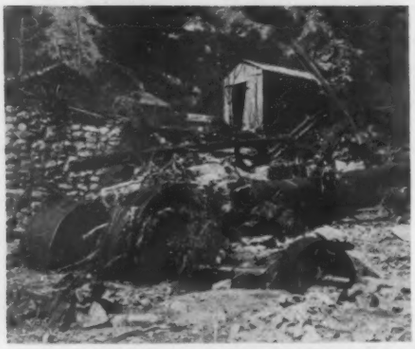
* * *

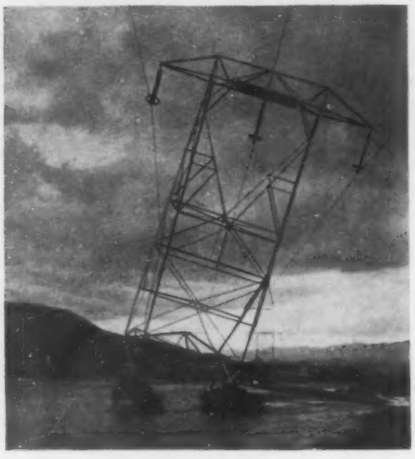
This "success story" of a great Diesel engine and a great lubricant is important to you. For it is a story that is being repeated day after day in mills, mines and factories all over the United States. Shell brings to your problem a "plus" in lubrication: The finest lubricants being refined today, plus resourcefulness born of practical experience. To avail yourself of this service, write or phone your nearest Shell office.

**SHELL INDUSTRIAL LUBRICANTS**

SHELL







California power lines take a beating. Top—A Coast Counties Gas & Electric line goes down at Watsonville; second—Nevada-California Electric substation near San Bernardino; third and fourth—Damage to Southern California Edison plant (Ontario No. 2) and transmission tower

calities was broken, electric heating and cooking appliances sold like watermelons at a July picnic.

Utah, as well as southern Idaho and western Wyoming, suffered when the heaviest snowfall in years struck unexpectedly March 13. Utah Power & Light Co. reported more than 500 breaks in Salt Lake City alone.

Although the southern California storm did not reach full force until March and was consequently not included in the state Division of Water Resources' February report, data collected to the end of February show that precipitation was normal or above at all points. Greatest precipitation (the result of one station only) was recorded in the Stanislaus River basin, which had 190 per cent of normal. Lowest was in the Santa Ana River basin with 100 per cent.

Meanwhile northern California was recovering from its February storms. Damage, which totaled $700,000, was mostly cleaned up; Pacific Gas and Electric Co. announced that as soon as weather permits it will spend approximately $100,000 on permanent reconstruction of its transmission line to Downieville and the Alleghany area in Sierra County.

●

## Plan to Buy Puget Sound Facilities Approved

Cause of public ownership took several turns in the State of Washington last month.

Power commissioners approved plans to form a state-wide power pool to purchase Puget Sound Power & Light Co.'s generation and transmission facilities.

Proposals for public utility district elections, placed before county commissioners of Walla Walla and Grant Counties, failed in the former and succeeded in the latter.

H. C. Ritzman, Seattle city building superintendent and president of the King County Public Ownership League, warning that the state-wide plan to purchase Puget Sound Power & Light would be a threat to the existence of Seattle City Light, advocated immediate purchase of Puget Sound's Seattle holdings.

Under the proposed state-wide power pool, commissions in counties served by Puget Sound plan to incorporate as one unit to make purchase at a cost estimated between $100,000,000 and $105,000,000.

## Hetch Hetchy Decision Rests With Judge

Federal government's suit to invalidate the Hetch Hetchy power contract under which Pacific Gas and Electric Co. distributes city-generated power to San Francisco drew near its close last month when opposing attorneys completed their arguments and stepped aside to await decision of Federal Judge Michael J. Roche.

Both sides had played their hands boldly in trying to prove or disprove the government's contention that the contract violates the Raker Act, under which San Francisco is granted the right to develop water and power in Yosemite National Park and Stanislaus National Forest.

Claims of the city were that the contract is one of pure agency, not of outright sale as the government contends; that, even if it is not, the government has no power to interfere because that would be an invasion of intra-state jurisdiction: that, assuming the government did have the power to interfere, it is barred from asking an injunction and termination of the contract by all rules of equity, for it stands to gain nothing whereas the city stands to lose $2,200,000 a year.

Meanwhile, Secretary of the Interior Ickes advised the city to move with "circumspection" in granting a new franchise to P.G. & E. Ickes' stand was taken on the grounds that if the government wins the power suit, the city will either have to purchase P.G. & E. distribution facilities or build its own system.

●

SEATTLE BOARD OF PUBLIC WORKS has approved plans and specifications for the $119,000 installation of equipment in City Light's South receiving substation. Major portion of the apparatus has already been purchased.

●

## Citizens Utility Company Signs Boulder Contract

Completion of a contract by which Citizens Utility Co., Kingman County (Ariz.) district may buy 50,000,000 wk.-hr. of Boulder power annually was announced last month by Harold L. Ickes. Price of the power, originally contracted for by the Metropolitan Water District of Southern California but relinquished because it cannot be used on the date the contract becomes effective, is 1.63 mills per kw.hr.

The contract was the second of its kind. The first was signed Jan. 28 with the Needles (Calif.) Gas & Electric Co. for 20,000,000 kw.-hr. annually of unused Metropolitan Water District energy.

## Seattle Contractors Tied Up by Wage-Hour Dispute

Seattle building industry, including electrical contracting, was tied up last month by a controversy over the re-establishment of the 8-hr. day, 40-hr. week for eight months of the year, 6-hr. day, 30-hr. week for the four winter months. Employees asked for wage increases. Employers, contending that the short work week contributes to excessive costs which in turn retard new construction, countered with a request for the longer work week and no increase in hourly pay, and promised that if at the end of one year these factors had not promoted more construction they would revert to the original plan.

In spite of the fact that the contractors called in the government to arbitrate the point, no decision was reached. This was largely the result of the unions' refusal to accept the compromise and the services of the federal mediator.

●

BIGGER THAN ANY previously built are three main units, now being designed by the Bureau of Reclamation, which will be purchased this year for Grand Coulee. Each unit consists of a 120,000-kva. generator driven by a 150,000-h.p. hydraulic turbine and a separate motor generator exciter. Also being designed are two 12,500-kva. hydro station units.

●

SUGGESTION BY THE National Resources Committee that the government spend $3,650,000 during the next six years for comprehensive studies of the nation's waterpower resources and potential power markets was sent to Congress last month by President Roosevelt. Areas to be studied would include those to be served by Bonneville, Grand Coulee, Central Valleys and Boulder. Coordination of the power systems of Boulder Dam and the Central Valleys Project is essential, the committee added.

●

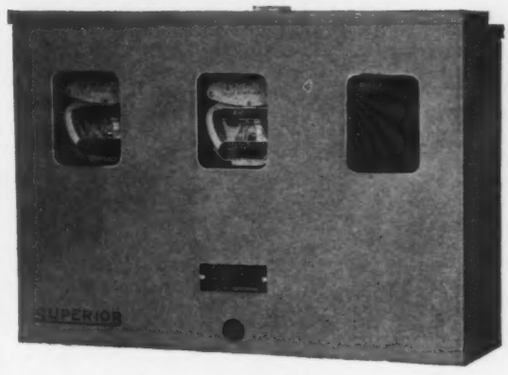
IN ORDER TO CONSERVE cash with which to pay $800,000 to its bondholders by April 30, Seattle City Light has discontinued acceptance from employees of other city departments of city general fund warrants in payment of bills and contract accounts.

●

UTAH POWER & LIGHT CO. last month filed with the state supreme court a brief in support of its petition for a rehearing in the Provo, Utah, power plant case. The company is seeking to prevent the city from carrying out plans to build a municipal power plant and sell $850,000 worth of bonds to finance construction.


# MULTIPLEX OVERALL METER ENCLOSURES

**(for ganging single phase meters)**




(Fig. C)

(Fig. E)

**Multiplex Overall Meter Enclosures are made in a variety of styles and sizes to meet requirements.**

The multiplex method of ganging single phase meters saves space, gives full protection and is easily and economically accomplished.

*Write for information on Superior Overall Meter Enclosures.*

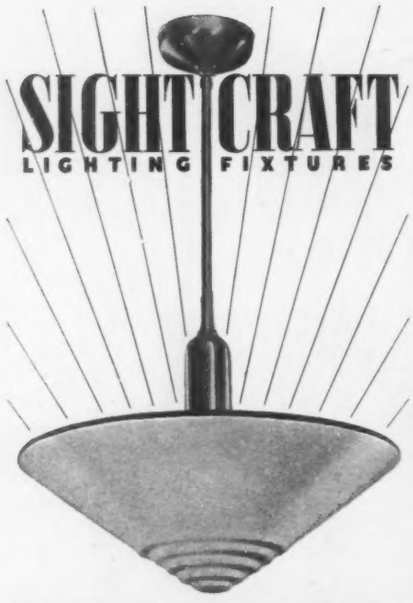
## Superior Switchboard & Devices Company

CANTON, OHIO

*Been at it Since 1920

SUPERIOR

REG. U. S. PAT. OFF.




Sight-Craft Luminaires win the approval of prospective customers . . . and win more sales for the dealer and contractor!
Designed by architects and Smoot-Holman lighting engineers, the Luminaires are beautiful in appearance and provide more light . . . properly distributed light . . . *balanced* light. First costs are low and maintenance costs are rock-bottom. You'll win more sales with Sight-Craft!

**BUILDING MANAGERS say . . .**
"Smoot-Holman Sight-Craft Luminaires have brought me many new tenants. Office efficiency is stepped up 20 per cent by providing better light with no glare or shadows."

**THE MANUFACTURER says . . .**
"Sight-Craft Reflectors give correct light distribution in my factory, with plenty of light where it's needed most. Maintenance costs are low . . . vitreous porcelain enamel is durable and easy to clean."

**THE CONTRACTOR says . . .**
"Smoot-Holman Equipment is the most profitable line I've ever handled. The fixtures are right in design and construction. Priced right, too . . . helps me win my share of contracts."

**SEND COUPON FOR 1938 CATALOGUE**

Smoot-Holman Co.
33 Dore Street, San Francisco
Please send your new Catalog E-48 to:
Name.....
Street.....
City.....State.....
My Supply House.....

SIGHT-CRAFT


THE 1939 ANNUAL SUMMER CONVENTION of the American Institute of Electrical Engineers will be combined with the Pacific Coast convention and held in San Francisco as the result of a vote by institute directors on Jan. 26. Place and date will be announced later.

●

NORTHWESTERN SECTION, IAEI, will hold its annual meeting Oct. 3-6 at the Davenport Hotel, Spokane. Arrangements are now being made for manufacturers' exhibits.

●

AWAITING APPROVAL of the regional office of PWA are plans and specifications for the double circuit transmission line for Skagit Line No. 2, reclassified as a PWA project. Bids, originally to have been opened March 17, must await this approval.

●

WAGE SCALE of electric switch repairmen has been cut by the Seattle Board of Public Works from $131 to $125 a month. The International Brotherhood of Electrical Workers, representing the repairmen, had asked for $175.

●

SUIT TO TEST THE legality of the election authorizing the district's formation was filed in Washington superior court last month by Public Utility District No. 1 of Wahkiakum County against the West Coast Power Co. and Paul Gisselberg.

●

OPERATING REVENUES of Northwestern Electric Co. totaled $4,605,690 in 1937, an increase of 10 per cent over 1936. Net profit was $608,318.

●

## Contracts Awarded

BY BUREAU OF RECLAMATION for equipment for the third unit of the Seminoe power plant, Kendrick project, Wyo., to Pelton Water Wheel Co. for 15,000-hp. hydraulic turbine, $64,854, and governor, $11,015; Allis-Chalmers Mfg. Co. for 12,000-kva. generator, $102,575.

BY U. S. NAVY DEPT. to Schuler & McDonald, Inc., Oakland, for constructing office building and garage, including electrical work, at Naval air station, Alameda, Calif. $16,977.

TO ROY M. BUTCHER, San Jose, Calif., for electrical work on dairy exhibit buildings at Sacramento. $10,528.

BY BUREAU OF RECLAMATION to Anaconda Wire & Cable Co. and Aluminum Co. of America for electrical conductor for transmission lines for Kendrick project, Wyo. Total cost, $437,516.

BY SAN FRANCISCO DEPT. of Public Works to Clinton Construction Co., San Francisco, for constructing Richmond-Sunset sewage treatment plant, including electrical equipment. $70,950.

BY PACIFIC GAS AND ELECTRIC CO. to Dinwiddie Construction Co., San Francisco, for building reinforced concrete superstructure for turbine room extension of Substation C, Oakland. To exceed $40,000.

BY SALT RIVER VALLEY USERS ASSN. to General Machinery Corp., Hamilton, O., for 5,000-kw. generator to be installed in new stand-by power plant near Tempe, Ariz. $415,000.

BY CALIFORNIA DEPT. OF PUBLIC WORKS to H. O. Bauerle, Los Angeles, for erecting and completing electrical ground lighting at state hospital, Camarillo. $5,757.

TO HATELY & HATELY, Sacramento, for furnishing and installing air conditioning system in fifth floor of Library and Courts Bldg. and in Office Bldg. 1 for California State Building Commission. $29,760.

BY BUREAU OF RECLAMATION to Mississippi Valley Structural Steel Co., St. Louis, for 30 bulkhead gates for installation at outlet ends of turbine draft tubes in left powerhouse of Grand Coulee power plant. $34,545.

BY TACOMA, WASH., BOARD OF CONSTRACTS & AWARDS to Home Electric Co., Tacoma, for furnishing two 115-kv. oil circuit breakers for Cushman No. 2 power plant. $26,906. To Love Electric Co., Tacoma, for four gang-operated disconnecting switches for the plant. $5,718.

TO GENERAL AIR CONDITIONING CO., Sacramento, Calif., for supplying air cooling, heating and ventilating equipment for the government office building and two dormitories at Kennett on the Shasta Dam site. $17,280.

●

## REA Activities

ORCAS POWER & LIGHT CO., East Sound, Wash., has awarded a contract to the NePage McKenny Co., Seattle, for building a complete generating plant for the project. Low bid was $36,527.

BLACHLY-LANE COUNTY COOPERATIVE ELECTRIC ASSN., Blachly, Ore., opened bids March 22 on construction of a dam, pipe line and powerhouse.

SEVENTY-FIVE RANCHERS met in Hyattville, Wyo., last month to adopt a resolution asking REA to extend lines from Manderson to Bonanza and thence north to a point beyond Tensleep; from Bonanza up Paintrock Canyon.

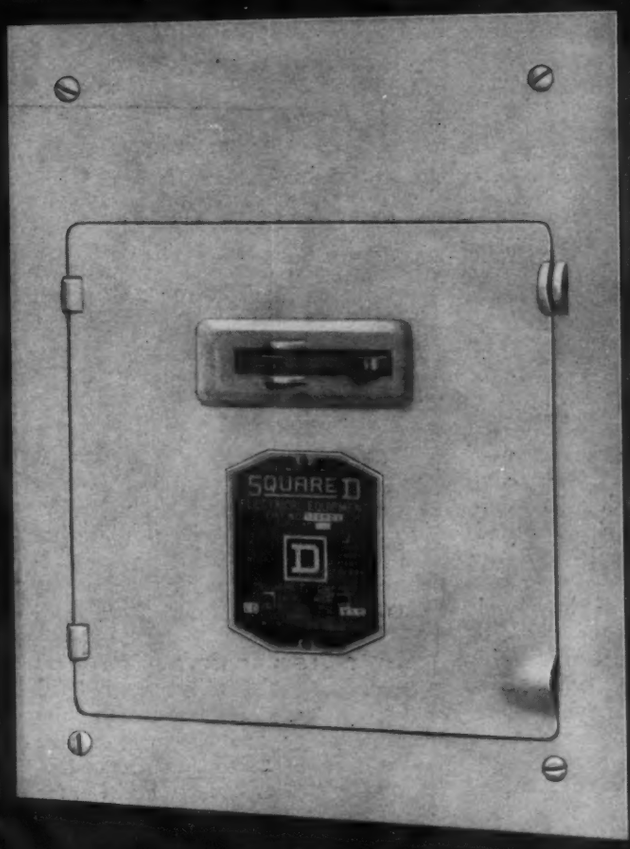
SAN LUIS VALLEY RURAL ELECTRIFICATION CO., Monte Vista, Colo., received from REA an allotment of $10,000 to finance house wiring and plumbing installations for about 100 customers.

PEOPLES LIGHT & POWER CO., Loa, Utah, received from REA an allotment of $5,000 to cover cost of material and equipment to build approximately 14 mi. of line to serve 38 customers in Wayne, Piute and Sevier Counties.

PLUMAS-SIERRA RURAL ELECTRIC COOPERATIVE, Blairsden, Calif., has awarded a contract to Fritz Ziebarth, Long Beach, Calif., for construction of the 229-mi. project. Low bid was $208,833.

ASSOCIATED FARMERS OF WHITMAN COUNTY, Wash., was organized last month to fight activities of AF of L representatives in trying to organize men employed on the REA project at St. John.

CLEARWATER VALLEY LIGHT & POWER ASSN., Lewiston, Ida., has awarded a contract for furnishing 1,700 meters for use on its lines to Graybar Electric Co., Spokane. Low bid was $16,741.




## A DOZEN GOOD REASONS FOR USING THIS NEW SWITCH

1. Greater Wiring Space
2. Easily removable interior for easier wiring
3. Range FUSE-BREAK has "on" and "off" positions
4. Main switch can be locked "off"
5. Side wiring gutters
6. Both line and load can run out top and bottom
7. Eleven 1¼" concentric knockouts in sides, top and bottom
8. Compensating screws for adjusting interior to plaster line in flush type
9. Complies with 1937 National Electric Code
10. Externally operated main switch for safe fuse replacement
11. Door and cover may be sealed
12. Compact and attractive in appearance.

# A NEW

## SQUARE D RANGE SWITCH WITH UNFUSED MAIN

**Check the features of this new fuseless main switch listed in the panel above . . . You will like it for range installations, and your customers will like it . . . It is exceptionally easy to install . . . You can do all your work from the front of the cabinet . . . Remove the interior, which is very simple, and you have 100% of the box area in which to work . . . Suggest the use of this new switch on your next job. Your distributor can supply you with full information regarding it or write for Bulletin CA-544. Square D electrical equipment is available through electrical wholesalers everywhere.**

**CALL IN A SQUARE D MAN**

SQUARE D COMPANY

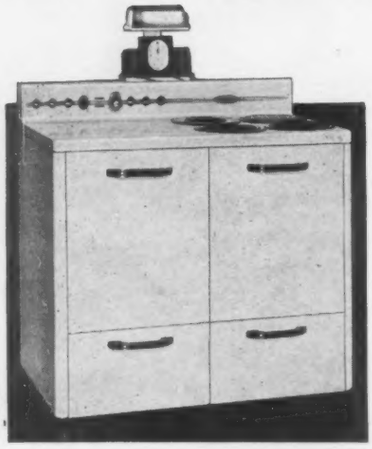
LOS ANGELES - MILWAUKEE - DETROIT

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

SPEED
ECONOMY

. . . electrical cooking
at its best in the

NEW 1938
SUPER-SERIES
Standard
ELECTRIC RANGES



No. 1540, one of the 10 New Super-Series Standard domestic ranges

A beautifully designed line incorporating advanced principles, including the

New Improved FASTER
KALMAX Burners
. . remarkable for speed . .
and the new Standard
EVEN-OVEN

● Standard Authorized Distributor and Dealer franchises offer important advantages, including effective promotional and sales support. Mail coupon at once for full details.

Standard Electric Manufacturing Corporation
Toledo, Ohio. W5
Please send Information on
☐ Super Series Standards for 1938
☐ Authorized Ditsributor Franchise
☐ Authorized Dealer Franchise
.....
.....


## New Developments Change Sacramento Utility Issue

In swift succession, three developments last month changed the aspect of Sacramento Municipal Utility District's efforts to secure a $4,000,000 PWA grant and to make use of a proposed $12,00,000 bond issue, and at the same time appeared to spell collapse of a proposed compromise between Pacific Gas and Electric Co. and the district. It had been proposed that the district forego plans to condemn, purchase or duplicate the company's Sacramento distribution system and that the company purchase all output of a projected district hydro plant at Silver Creek. The developments:

1. PWA ruled that its loan and grant could not be used for a hydro plant at Silver Creek because such could not be completed by June 1939.

2. Lester Ready and J. G. Butler, consulting engineers, recommended to the district's board that it undertake condemnation and purchase of P. G. & E. distribution facilities rather than attempt to parallel the system.

3. Ready, as consulting engineer for the California Water Authority, recommended against that body's approving a Silver Creek plant on grounds it would interfere with future marketing of power from Shasta Dam, key unit in the California Central Valleys Project.

Ready urged that the district build a steam plant, as a need for such future capacity would be independent of hydro developments.

Condemnation and purchase would also preclude securing the PWA money. Efforts to obtain these funds were a major reason for the proposed company-district compromise.

●

TO ILLUSTRATE ITS FUNCTION in the industrial world, Pacific Gas and Electric Co. has constructed at Stanford University a showcase exhibit of a power plant. The display is one of fifteen contributed by various leading industries in the San Francisco Bay region.

●

FIVE NEW PUMPS are being installed by the Province of British Columbia as additional equipment for the dyking areas east and west of the Pitt River in the Fraser Valley region. This will double the present facilities.

●

REPORT SHOWING, in the form of typical net monthly bills, the rates charged as of Jan. 1 to residential, commercial light, commercial power and industrial consumers of electric energy in cities of 50,000 or more population has been issued by the Federal Power Commission. The report is designated "1937 Rate Series A."

PRODUCTION AND CONSUMPTION of electric power in British Columbia reached an all-time high in 1937. Output rose from 2,035,000,000 kw-hr. in 1936 to 2,120,000,000 kw.-hr. last year, an increase of 4.2 per cent.

●

RETAIL CUSTOMERS of Oregon's electric utilities used 8.32 per cent more kw.-hr. in 1937 than in 1936. Total sales reached a new high of 1,018,283,273 kw.-hr.

●

SALE BY SIERRA NEVADA LIGHT & POWER CO. of California of electric light and telephone utilities in Parker, Ariz., to Joseph and Nellie T. Bush has been approved by the Arizona Corporation Commission. Purchase price was $25,000.

●

QUINAULT ELECTRIC CO.'s power plant at Quinault, Wash., will be completed by June, it was stated last month coincident with the announcement of the approval of the 230-hp. turbine manufactured by Pelton Water Wheel Co. for the project.

●

YUMA, COLO., VOTERS have authorized $70,000 in bonds for improvement to the local power plant.

●

PUBLIC UTILITY DISTRICT No. 1, Lewis County, Wash., has retained Baar & Cunningham, Portland electrical engineers, to prepare plans for construction of projected rural lines in the district.

●

NOW OPERATING is Idaho Power Co.'s new substation at Fort Hall, Ida.

●

PROPOSED APRIL 4 JOINT meeting of the San Francisco and Los Angeles sections, Illuminating Engineering Society, was abandoned at the request of President Dates in favor of separate meetings in each city.

●

## B.C. Engineers Evolve Plan to Turn Nechako Watershed

Discovery of a feasible method of turning the great Nechako watershed in British Columbia seaward and thereby developing one of the world's largest potential water reserves has been announced by engineers of the B. C. Department of Lands.

Rising in a circle of large lakes, the Nechako at present runs eastward into the Fraser River near Prince George. Government engineers report that if it were diverted westward through the coast mountains to the sea it would develop 1,000,000 h.p. in electricity. This would be nearly twice the total amount of electricity now being produced and used in British Columbia.

# ABOUT PEOPLE

## Chauncey M. Brewer Dies; Cleland Takes Office

Chauncey M. Brewer, 56, president of California Oregon Power Co., died at his home in Medford, Ore., March 2. Entering the electric utility field in his native state of Michigan, Mr. Brewer served several years with Michigan power companies, in 1910 became sales manager at Mankato, Minn., for Northern States Power Co. and later transferred to Sand Point, Ida., as operating manager of Northern Idaho & Montana Power Co.

In 1912 Mr. Brewer came to Richmond, Calif., as manager of Western States Gas & Electric Co. Seven years later he was named vice-president and general manager of Mountain States Power Co. and in 1929 he was appointed to the same position with California Oregon Power Co. He was elected president of both companies in 1931 but resigned from the Mountain States company last year.

Succeeding Mr. Brewer as president and director is Hance H. Cleland. Valuation and rate expert for the company for the past thirteen years, Cleland practised law in Oregon and Washington from 1910 to 1936. He was assistant attorney general of the State of Washington from 1916 to 1919, and a member of the Washington Public Service Commission and its successor, the Department of Public Works, from 1919 to 1924.

●

THREE NEW DIRECTORS elected to the board of Southern California Edison Co. last month are: Will H. Fischer, vice-president in charge of public relations; Roy V. Reppy, vice-president and general counsel, and D. M. Trott, vice-president in charge of finance. The vacancies were created by the retirement of George I. Cochran and Ben R. Meyer and the death of Henry M. Robinson.

●

## Stahl Succeeded in Fresno Engineers Club Presidency

E. G. Stahl, sales engineer for San Joaquin Light & Power Corp., has been succeeded as president of the Engineers Club of Fresno, Calif., by Claude H. Weekes, superintendent of the Fresno City Water Dept.

Other new officers of the club are: A. D. Bragg, General Electric Supply Co., vice-president, and T. W. McCloskey, San Joaquin Light & Power, secretary-treasurer. Directors are E. B. Abbott, G. B. Cornell, C. H. Horton and A. W. Miller.

HANCE H. CLELAND

## General Electric Supply Shuffles Officers

S. M. Frellson, former district appliance sales manager (of major appliances) in the San Francisco office of General Electric Supply Corp., was last month transferred to Los Angeles in the same capacity. He succeeded J. Richard Ryan and is replaced by George A. Lloyd.

Walter Boland, formerly lamp sales specialist in the San Francisco office, was named assistant to Lloyd; C. S. Perkins, supply salesman in the Stockton area, took over Boland's post, and C. C. Johnson succeeded Perkins.

●

RAY A. EDWARDS has just been appointed to the newly created position of personnel director for the San Diego Consolidated Gas & Electric Co. To his former position as Safety Director, James E. Smith has been named.

●

L. C. WHITE, Portland General Electric manager of the Gresham, Ore., office, has been elected president of the Gresham Chamber of Commerce.

●

ALLEN FOOTE, salesman for El Portal Electric Co., Las Vegas, Nev., was again a "quota buster" for the third consecutive year in the Westinghouse appliance national campaign.

●

C. V. BRENNAN has been elected president of the Professional Engineers Association of British Columbia. Vice-president is P. L. Lyford. F. W. MacNeill is council member representing electrical engineers.

●

BERT KENDRICK of Northern Utah Electric Co., Logan, Utah, has been made a member of the Kelvinator pioneer club because he sold over $10,000 worth of refrigerators in 1937.

NEW OFFICERS HAVE been elected by the Ben Franklin Electric Club of Northern California for the 1938 administrative year. President is S. B. Gregory, San Francisco district manager, Arrow-Hart & Hegeman Co., with L. Siebert, Trumbull Electric Co., and A. H. Rockwell, Appleton Electric Co., vice-presidents. New directors are Lee Lethine, Anaconda Wire & Cable Co., and W. W. Glosser of Hubbard & Co. H. Q. Noack, Hubbard & Co., was reelected secretary.

●

R. N. NIGHTINGALE, former electrical engineer with the Department of Public Utilities, Tacoma, Wash., has been appointed chief engineer of the department. He is the first person to hold the job since Llewellyn Evans joined the TVA a few years ago.

●

T. COLE CAWTHORNE, formerly connected with Norge, has been appointed Oregon manager of F. B. Connelly Co. George L. Sammis, ex-Portland resident and recently employed by Norge in Chicago, has been named Pacific Northwest district manager for Norge.

●

U. N. HALLIDAY, formerly connected with John A. Roebling's Sons, Los Angeles, has joined Pacific Electric Mfg. Co., San Francisco.

●

JERE ROBINSON, electrical engineer, has been appointed to the Board of Fire Underwriters of the Pacific, Los Angeles, to succeed J. DeVoe who recently resigned.

●

FRED HAUSER, for the past twelve years associated with Mast's, Inc., appliance store, has been named manager of the firm's store at 1405 Third Ave., Seattle.

●

ARTHUR A. LORCH has been named manager of the Seattle office of Marwood, Ltd., manufacturers' agent and distributor. John E. Richardson, formerly connected with Wagner Electric Co., has been appointed salesman in the Seattle office.

●

REGISTRATION OF PARTNERSHIP in the Modern Electric Co., Vancouver, B. C., has been filed by D. Wilde, G. Cameron and A. Gustin.

●

JOHN A. BAKER, field representative of the Denver League, RMEL, was largely responsible for that organization's adding 5,200 additional outlets and 796,580 watts in 133 homes, apartments, etc., in 1937.

●

EUGENE SACHT, inside salesman in Electric Corp.'s San Francisco office, has become an outside salesman. He is succeeded by Stanley Perry.

STEEL STRAND • TELEPHONE WIRE

Crapo

GALVANIZED PRODUCTS

SCIENTIFICALLY MADE TO MEET SPECIFIC DEMANDS

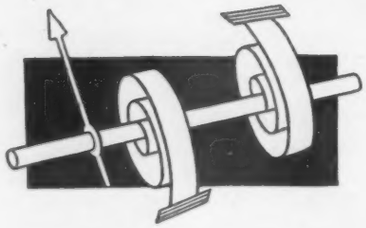
Crapo Galvanized Steel Strand is produced from start to finish to meet the specific demands of the service for which it is intended. Each wire used in forming a particular size and grade of strand is made from the same special steel, scientifically processed in the same way, uniformly galvanized by the Crapo Process. The tough, heavy, pure zinc galvanized coating, tenaciously bonded to the wire by the Crapo method, withstands the abuse of construction, provides lasting protection.

Crapo Galvanized Strand and Crapo Galvanized Telephone Wire constantly are setting new records for long, economical life and low maintenance costs. Ask your Jobber, or write direct!

INDIANA STEEL & WIRE CO.
Muncie, - - Indiana

LINCOLN DEMAND METERS

ONLY ONE UNIT MOVES



The unit shown above consists of the center shaft, two bimetallic coils, and the pointer. This comprises the moving element of the Lincoln Maximum Demand Meter. The only motion is the slow expansion of the coils and the slow turning of the shaft.

TYPE WD

SEND FOR YOUR COPY OF CATALOG TO

LINCOLN METER COMPANY
SPRINGFIELD, ILLINOIS

Charles F. Dalziel of the department of electrical engineering, University of California, who wrote the article, "Danger of Electric Shock"

PAUL CORRIER, assistant merchandise superintendent for San Diego Consolidated Gas & Electric Co., has been named company district agent at Coronado, Calif. He succeeds W. A. Lambert who died of heart attack Feb. 11.

●

J. W. CARY is now electrical and building inspector in Exeter, Calif. Many years ago he owned the Exeter Electric Co., then went into neon sign business and recently was asked to assume the responsibilities of inspection. The new uniform building code and electrical ordinance has been adopted.

●

AL MYERS, president and manager of L. J. Myberg Co., has been named president of the San Francisco Better Business Bureau.

●

SIDNEY W. RUSSELL, manager of Dixon-Taylor-Russell Co., Provo, Utah, electrical appliance store, has been re-elected president of the Provo Chamber of Commerce.

●

GEORGE H. PETERSEN, former right-of-way engineer for the Idaho state highway department, has been named superintendent of Idaho Power Co.'s new land and tax department. He will be assisted by M. E. Hughes.

●

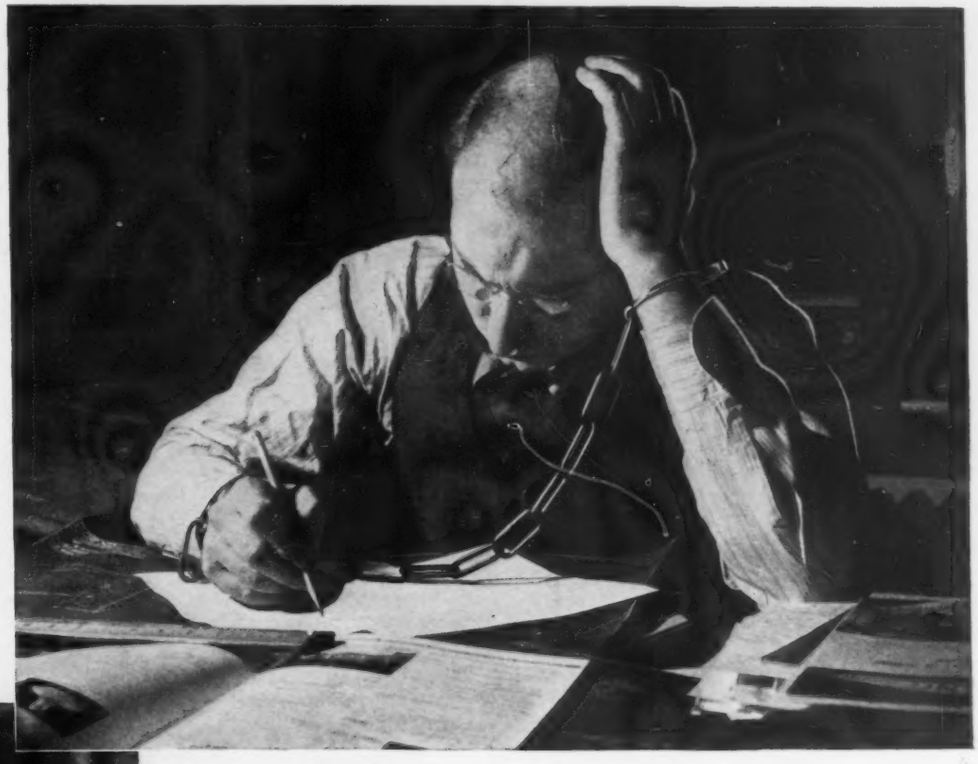
W. B. LEWIS, manager of the Globe branch of Arizona Edison Co. since 1928, has been transferred to the Superior branch. He is succeeded by his Superior predecessor, H. H. Idle.

●

STANLEY G. FISHER, formerly connected with Westinghouse's dishwasher sales department and merchandise advertising department, has been appointed manager of dishwasher sales. Fisher was born in San Francisco and educated in Denver.

# FREE YOURSELF....

## FROM LIGHTING PROBLEMS!



**LET PERMAFLECTOR ENGINEERS SOLVE THEM..** Your time is too valuable to spend solving knotty lighting problems. You need more time for selling—more time for the numerous complex problems of your business.

Unchain yourself from this burden by sending your lighting problems to Permaflector engineers. These well-trained lighting experts await your command to step forward and help you with blueprint suggestions based upon their many years of varied lighting experience.

Send complete information on your jobs direct to Pittsburgh or, if you prefer, to your local Permaflector representative. You will receive complete layouts that will solve the problems efficiently and please your customers instantly.

**PITTSBURGH REFLECTOR CO.**

Pittsburgh Pennsylvania

Representatives in 28 Cities

*Permaflector—the silvered glass reflector with the permanent reflecting surface.*

**PERMAFLECTOR** *Lighting*

PERMAFLECTORS · LUSTROLIERS · LUMINAIRES · SPOTLIGHTS · URNS
FLOODLIGHTS · LAMPS · BUILT-IN CEILING UNITS · ACCESSORIES

**PITTSBURGH REFLECTOR COMPANY** EW-4-38
**OLIVER BLDG., PITTSBURGH, PA.**

Please send me complete information on Permaflector lighting equipment and details of your free engineering service.

NAME .....

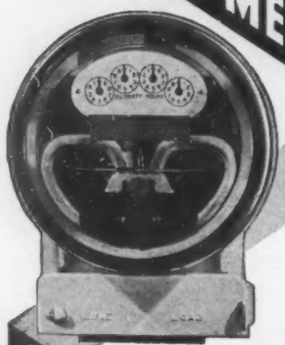
STREET .....

CITY ..... STATE .....

TWO-ELEMENT SINGLE-DISK Watthour Meters are

MODERN METERS

Sangamo Type L-2-S Two-Element, Single-Disk, Socket Mounting Meter



Sangamo Type L-2-A, Two-Element, Single-Disk Meter In "A" Base

For MODERN LOADS

Western Offices:
LOS ANGELES
326 Subway Term. Bldg.
SEATTLE
220 Ninth Ave. N.
PHOENIX
448 W. Madison St.
SAN FRANCISCO
1061 Howard St.
DENVER
1526 Blake St.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

FRED H. COLE has been appointed general manager of Bowie Switch Co., San Francisco.

●

## Deaths

JOSEPH A. THALER, 73, head of the school of electrical engineering at Montana State College, died last month. Born in Austria, he studied at the University of Minnesota engineering school, then served as instructor there and later at Purdue. He came to Montana in 1903. He was secretary and student councilor of the Montana section of the AIEE.

●

THEODORE ILL of the Los Angeles Bureau of Power & Light and secretary for the past several years of the Los Angeles Electrical Estimators Club died March 5 in Los Angeles.

●

HOWARD SMITH, 75, retired vice-president of Southern California Edison Co., died suddenly at his home in Los Angeles, March 22.

●

## Speakers

E. A. Lowden, appliance sales manager, Westinghouse Electric & Mfg. Co.: "Knowledge of the product being sold begets confidence; confidence builds sales"—at a Vancouver, B. C., sales rally organized by Canadian General Electric Co., Canadian Westinghouse Co., Northern Electric Co., B. C. Electric Railway Co., Electrical Service League of B. C., and the Vancouver Electrical Assn. and attended by 500 electrical contractors, appliance dealers and salesmen.

W. Garlich, Western sales manager for Frigidaire: "Frigidaire sales over the past two years showed the largest percentage increase in British Columbia"—at a meeting of B. C. Frigidaire dealers.

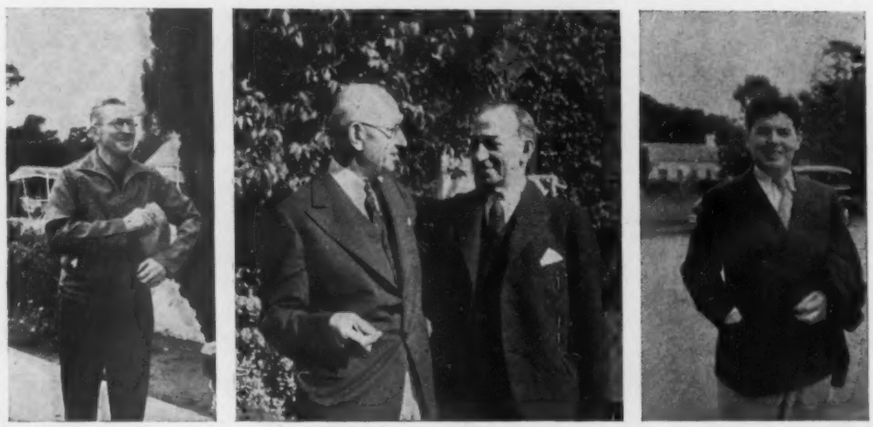
Dr. Frederick C. Cordes, clinic professor of ophthalmology of the University of California Medical School will be principal speaker at the May 3 meeting of the Sight Conservation Council of Northern California.

Charles H. Barnes, chief engineer, Lane-Wells Co.: "Plant Operation and Lighting Installation"—at dinner meeting of Southern California Section, IES.

Harold Gerber, chief inspector, San Francisco Dept. of Electricity: Changes in the 1937 edition of the National Electrical Code affecting the illumination engineer—at March 11 meeting, Illuminating Engineering Society, San Francisco Bay Cities Section.

Puget Sound Chapter, Northwestern Section IAEI, heard a varied program at its last meeting. A. M. Chitty, district manager, Southwest Section, Puget Sound Power & Light Co., spoke on "Position of the Utilities with Respect to the Inspector"; E. E. Lee, deputy inspector, City of Seattle, on the "Obligation of the Contractor to Himself, the Public and the Inspector," and Sam Hepler, executive committeeman for District 8, National Electrical Contractors' Assn., who had just returned from a meeting in New York, on a program of the NECA. E. G. S. Pryor, Underwriters Laboratories; A. Nicholson, chief inspector, Seattle, and Maj. E. G. Dome, commissioner of Public Works at Olympia, also spoke. Meeting night was changed from Thursday to Friday, with the next meeting scheduled in Tacoma.

## Pacific Coast Wholesalers Frolic at Del Monte

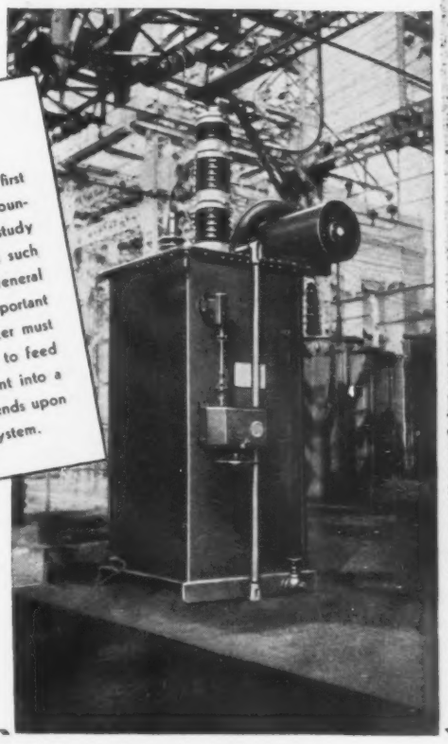


That unusual California weather failed to dampen the ardor of those attending the Del Monte meeting of Pacific Coast wholesalers. Rain didn't interfere with the golf of George T. Bryant, district sales manager of Economy Fuse & Manufacturing Co. (left). Harry Harper, Pacific Coast District manager of Graybar, and J. A. Kahn, Rocky Mountain district manager of G-E Supply, took advantage of one spell of sunshine (center). Harold Q. Noack, Hubbard district sales manager, took time out after running the Tower Room party

# The G-E Ground-fault Neutralizer Clears Momentary Line-to-ground Faults Without Tripping of Circuits*

**APPLICATION EXPERIENCE VALUABLE TO YOU**

Since 1921, when General Electric built the first ground-fault neutralizer manufactured in this country, G-E engineers have been leaders in the study and application of this device. To date, all such devices installed in this country are of General Electric manufacture. This experience is important to you, because the ground-fault neutralizer must be designed to have the correct reactance to feed exactly the right amount of lagging current into a fault. In addition, correct installation depends upon proper tuning of the neutralizer to the system.



BY clearing transitory line-to-ground faults on systems, the General Electric ground-fault neutralizer (Petersen coil) eliminates one major source of service outages.

It gives all-year-round protection, because it clears *all* types of transitory line-to-ground faults, including those caused by lightning, winds, sleet storms, or falling tree limbs.

It protects the entire system, clearing faults wherever they may occur.

**Low-cost Operation**

Because it is located at the station, installation of the ground-fault neutralizer is simple. Maintenance is practically negligible—the neutralizer needs no more attention than a transformer. As a result, the neutralizer is an outage-preventing device that costs exceptionally little to operate.

To obtain complete information on the ground-fault neutralizer and its application, get in touch with your G-E representative or mail the coupon to General Electric, Schenectady, N. Y.

**Record of one 33-kv ground-fault neutralizer: 288 out of 316 (91%) faults of all types cleared without a line trip-out.*

GENERAL ELECTRIC

Filing No. 500

General Electric
Dept. 6C-201
Schenectady, N. Y.

Please send me a copy of your new descriptive and application bulletin on the ground-fault neutralizer (GEA-2841).

Name.....

Firm.....

City..... State.....

310-28

KLEIN
"Lightweight"
CLIMBERS

Klein "Lightweight" Climbers are built to the minimum weight possible consistent with maximum safety. Every pair is tested exactly the same as are the old time tried Standard Climbers. The lineman can throw his weight on these climbers with confidence —they are Klein's!

DISTRIBUTED THROUGH JOBBERS

Foreign Distributor: International Standard Electric Corp., New York

The four pamphlets listed below will be sent without charge to anyone interested. Check the ones you want:

- ☐ Lightweight Climbers.
- ☐ Specifications on Linemen's Belts and Safety Straps.
- ☐ Klein Kord Fabric Safety Straps.
- ☐ Pocket Tool Guide.

Mathias KLEIN & Sons
Established 1857 Chicago, Ill. U.S.A.
3200 BELMONT AVENUE

TERM OF "TOPPER" offered by General Electric Co. to salesmen who sell at least $5,000 worth of G.E. refrigerators has been awarded five men of Utah Power & Light's Salt Lake division sales force; D. L. Freebairn, Topper in 1935, '36 and '37; Sherman Nabaum, Topper in '36 and '37; Paul Monson, G. A. Rowsell and A. C. Patterson.

●

DOUGLAS ROBERTSON, member of the staff of Canadian General Electric Co., Ltd., Vancouver, since 1926, has been appointed manager of the Vancouver office. He succeeds the late George Wright.

●

GLENN KERRIHARD, heating department manager for a Seattle department store, has been appointed manager of the heating division of F. B. Connelly Co., Norge distributor for Washington and Oregon.

●

ARTHUR BASSETT, sales engineer for Curtis Lighting, Inc., has joined F. J. Airey Co., representative for Curtis products in Los Angeles.

●

C. L. TRIBBLE of the General Electric Supply Co., San Francisco, was awarded first prize in G.E.'s "All-American" drive on home laundry equipment.

●

LESTER M. BAXTER, Portland, has been appointed Smoot-Holman Co.'s representative in Oregon, Idaho and Montana.

●

W. I. POWELL, merchandising manager of Westinghouse Electric Supply Co., San Francisco, has been appointed to the PCEA sales training committee. He replaces C. T. Templeton of Westinghouse Supply.

●

WILLIAM S. MCCREA, JR., resigned recently from his position as cost and rating engineer for the Tacoma, Wash., public utilities department.

●

JACK L. HURSCH, Denver, has been named to represent Proctor Electric Co. in Colorado and Wyoming.

●

RICHARD E. FOLLAND, secretary of the Electrical League of Utah for over ten years, left April 1 to become president of the Latter Day Saints South African Mission, Capetown, South Africa.

●

JOHN G. PHILLIPS has registered his partnership in Phillips Radio & Electric, New Westminster, B. C.

●

FRANK LAWSON, assistant engineer, Pacific Gas and Electric Co., has resigned to join the Chicago staff of the Federal Power Commission.

# TRADE NOTES

ANNUAL SALES MEETING of S & M Lamp Co. was held in Los Angeles for the purpose of laying plans for 1938 and celebrating 1937's 46.7 per cent increase in sales over 1936. Among others attending the meeting were W. G. Shirreffs, vice-president and chief engineer, Los Angeles; Jim Edwards, district manager, Vancouver, B. C.; John Allen Ware, district manager, San Diego; Jim Shirreffs, president and general manager, Los Angeles; Ray Fox, sales manager, automotive and marine divisions, Los Angeles; Lester Baxter, district manager, Portland; Ken Durnal, district manager, automotive division, San Francisco; George Curtiss, district manager, flood-light division, San Francisco, and Art Johnson, sales manager, flood-light division, Los Angeles.

●

WESTINGHOUSE ELECTRIC & MFG. CO. has realigned its industrial department into three new departments: industrial, resale and industry engineering. In charge are C. B. Stainback, Bernard Lester and C. A. Powel.

●

TUCANON ELECTRIC CO. is the new name of Starbuck Electric Co., Seattle, recently taken over by trustees of the school fund of the Pietrzycki estate. Joe Zink is manager.

●

ASPER & ECKSTADT HOME APPLIANCES has purchased the appliance and radio business of J. H. Siegrist, 214 N. Euclid Ave., Ontario, Calif., and moved to 203 W. B St., Ontario.

●

ASSOCIATED ELECTRIC SERVICE CO., Base Line and F Sts., San Bernardino, Calif., is a consolidation of the Home Appliance Co. and the Associated Electric Service Co. J. L. Hollingsworth, formerly in charge of the Home company, is manager of the new organization.

●

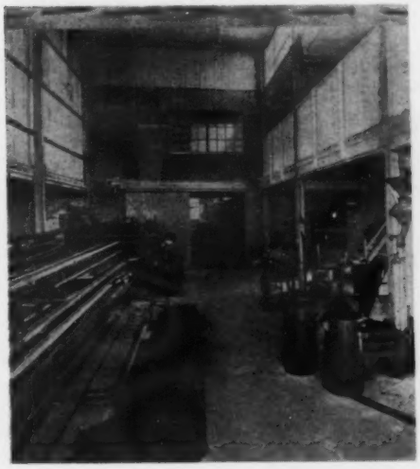
CONSUMER BOOKLET entitled "Home Hints on Selecting and Cooking Meats" has been published by Westinghouse in collaboration with the National Live Stock & Meat Board. The booklet serves to promote the Westinghouse refrigerator and its "meat keeper."

●

OCEANSIDE is to get a new office and showroom for the branch of the San Diego Consolidated Gas & Electric Co. located there. Occupancy of the new premises is expected this month.

●

CALIFORNIA RADIO & ELECTRIC CO., 2521 S. Normandie, Los Angeles, is a new electric appliance and radio service shop.



Increased business has been responsible for Gardner Electric Mfg. Co.'s making two additions to its Emeryville, Calif., factory. These additions, totalling 6,000 sq. ft. of floor space, give the company frontage on two streets plus new spur track facilities. A considerable amount of new machinery and equipment was also installed. Above is a view of one of the additions in which transformer tanks are made by electric welding

MAYDWELL & HARTZELL, San Francisco representative for Sauter Time Switches, has been given additional representation in Washington, Oregon, Idaho and Montana.

●

HEALTH APPLIANCES, LTD., is a new electrical appliance store opened at 422 Metropolitan Bldg., 837 W. Hastings St., Vancouver, B. C.

●

UNIVERSITY ELECTRIC CO., Seattle, has taken a five-year lease on new and larger quarters in the Wilsonian Apartment Bldg., Seattle.

●

## Moved

PETERS ELECTRIC CO., vacuum cleaner manufacturing and repair shop, to 12230 Ventura Blvd., N. Hollywood, Calif.

SAM L. WICKERSHAM ELCTRICAL APPLIANCES from 117 E. A. St., Ontario, Calif., to now consolidated store of J. Paschke Co., 128 N. Euclid Ave., Ontario.

INLAND LIGHT CO., contractor-dealer establishment, from 1412 Fulton St., Fresno, Calif., to 1925 Merced St., Fresno.

B. HARTMAN, manufacturer of wiring fittings, from 168 Sunset St., Long Beach, Calif., to new and larger manufacturing quarters at 708 W. Esther St., Box 708 W. State St., Long Beach.

SUNSET ELECTRIC CO., distributor of Frigidaire, Delco, Easy, Philco lines, from 1530 Eleventh Ave., Seattle, to larger quarters at 300 Westlake Ave., n., Seattle.

W. G. MCWHINNIE ELECTRIC, Inglewood, Calif,. senior G. E. dealer of the George Belsey Co. distributorship, to new building.

STONE & WEBSTER ENGINEERING CORP., Seattle, from the Central Bldg. to the Lloyd Bldg.

F. B. CONNELLY CO., Portland office, to new and larger building at 835 NW. Flanders St.

# STOP INTERRUPTIONS *This Year!*

Made to operate from left to right or vice versa—and in types for light, medium and heavy duty. For best results use S & C fuse links.

REG U.S. PAT OFF

# SEMAFOR RECLOSING FUSES

SAVE LOADS...SAVE COMPLAINTS
AND SAVE SERVICING COSTS

For sectionalizing—and branch circuit installations, and even substations—S & C Reclosers reduce expenses three ways by automatic re-establishing service after momentary trouble. They stop complaints and the expense of long interruptions.

S & C Reclosers have established new records for dependable protection,—they are the simplest in construction and have the fewest parts.

Made in two and three fuse assemblies for system voltages up to 46,000 Volts . . . Write for Distribution Cutout Bulletin No. 215-A.

The heart of any cutout is the Fuse Link . . . S & C Links used in S & C Cutouts may also be used in other makes of cutouts.

WESTERN REPRESENTATIVES

San Francisco: Geo E. Honn, 420 Market Street
Los Angeles: Farnham & Cunningham, Edison Bldg.
Seattle: T. S. Wood, 220 Ninth Street, North
Salt Lake City: Riter Engineering Co., Kearns Bldg.

**SCHWEITZER & CONRAD, Inc.**
4435 RAVENSWOOD AVENUE . . . CHICAGO, ILLINOIS
Manufactured in Canada by Powerlite Devices, Ltd., Toronto, Can.

★ *An Opportunity*

**TO LOWER YOUR OVERHEAD AND TO OBTAIN COMPLETE WAREHOUSING FACILITIES REASONABLY**

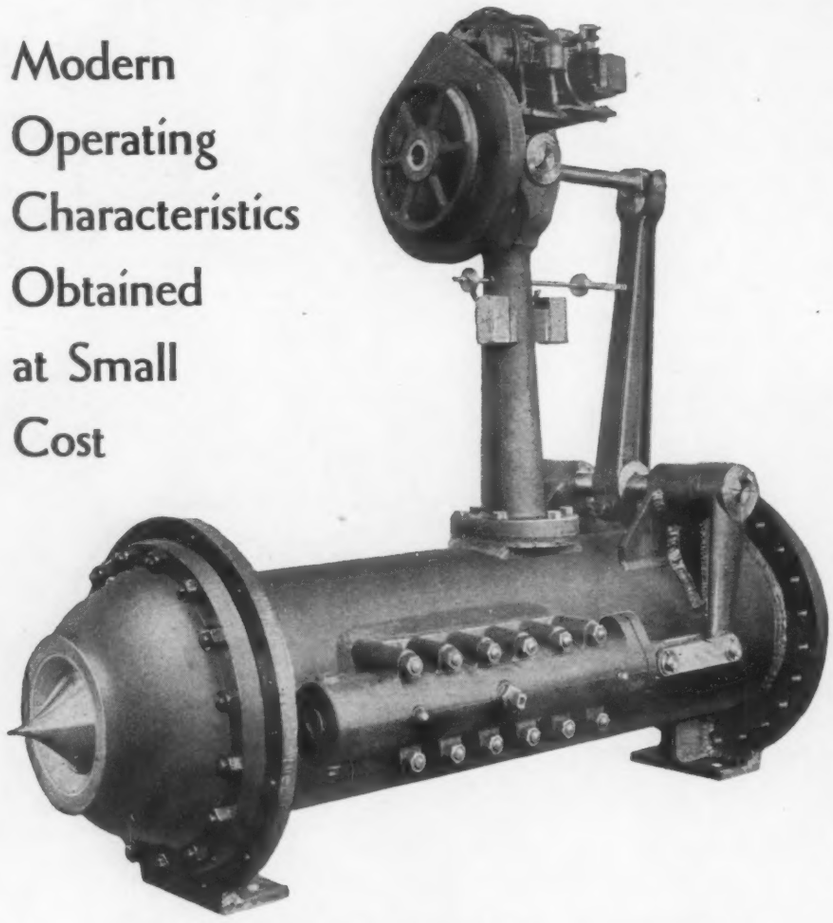
TO SUBLET IN SAN FRANCISCO—5000-6000 sq. ft. of office and warehouse space in new, modern, Class "C" building at San Francisco-Oakland Bay Bridge head. Complete shipping facilities include 2500 lb. freight elevator, 2500 lb. scale, two shipping entrances accommodating the largest transport trucks, case chute, etc.

Ideally suited to meet the needs of a manufacturer's representative or as a branch office of some eastern manufacturer.

Terms are reasonable. Overhead can be reduced further by employing efficient shipping and accounting services already established in building.

ADDRESS INQUIRIES TO BOX 100, ELECTRICAL WEST, 883 Mission St., San Francisco, Calif.

Modern Operating Characteristics Obtained at Small Cost



This modern, high efficiency straight-flow nozzle, together with a runner of latest design, was practically all the hydraulic equipment needed for modernizing a thirty-year-old plant in California. From the standpoint of power output, operating cost, efficiency and safety, the modernized unit is far superior to the original installation, reconstruction costs having been comparatively insignificant.

Further details on this and other rehabilitated plants may be readily secured from Pelton engineers.

**The Pelton Water Wheel Company**

HYDRAULIC ENGINEERS

120 Broadway NEW YORK | 2919 Nineteenth St. SAN FRANCISCO | Paschall Station PHILADELPHIA

PELTON

# NEW BOOKS

RADIO ENGINEERING by Frederick Emmons Terman, 813 pages illustrated, published by McGraw-Hill Book Co., $3.75, available at McGraw-Hill Book room, 883 Mission St., San Francisco. Essentially an abridged version of "Radio Engineering" by the same author, "Fundamentals of Radio" sticks to fundamentals, is intended for the beginner. Understanding of a.c. circuits is prerequisite but a knowledge of complex quantities is not. Included are chapters on acoustics and television.

●

TRANSFORMER PRINCIPLES AND PRACTICE, by J. B. Gibbs, 210 pages illustrated, published by McGraw-Hill Book Co., $2.50, available at McGraw-Hill Book room, 883 Mission St., San Francisco. Mr. Gibbs has endeavored to hold mathematical treatment at a minimum describing various types of transformers and principles underlying their operation. For those desiring a more penetrating study, a chapter is included on transformer calculations. The work covers practical as well as physical consideration including material on relative cost of operating transformers as affected by their losses, regulation, and reliability.

●

A. S. T. M. STANDARDS ON ELECTRICAL INSULATING MATERIAL, 373 pages, paper bound, published by the American Society for Testing Materials. In addition to the current report of the committee on electrical insulating material, the compilation includes all 37 of the Society's specifications and test methods. Included are discussions prepared by three prominent technologists on significance of tests involving dielectric strength, resistivity, and impact.

●

NATIONAL ELECTRICAL CODE handbook, fourth edition, based on 1937 code, by Arthur Abbott, McGraw-Hill Book Co. Because the National Electrical Code in its 1937 edition has itself been re-edited and made more convenient to use, the need for a book such as this may seem less important. This would be true if the code—a book of rules written in legalistic manner—were explained as helpfully as is done in this code handbook. The handbook not only gives the rules but also illustrates their applications, and by example and diagram suggests the easiest and most effective way in which to design a wiring layout within the scope of the code.

# PRODUCT DATA

Free to you . . . Any of these instructive bulletins simply by addressing a post card to ELECTRICAL WEST and asking for the desired bulletin by number.

**401:**

NEW TYPE SCREWS with cross-shaped, tapered slot recessed in head; available for all purposes; described in four-page leaflet. American Screw Co.

**402:**

PORTABLE ELECTRIC TOOLS, including thirteen new tools, listed in catalogue. Van Dorn Electric Tool Co.

**403:**

CONTROLLING AND DISTRIBUTING APPARATUS for electric light and power catalogued and described. Bull Dog Electric Products Co.

**404:**
RECORDING AND CONTROLLING HAIR HYGROMETERS; catalogue. Brown Instrument Co.

**405:**
RURAL LINE DROPOUT RECLOSING FUSE SWITCHES described and illustrated in leaflet. W. N. Matthews Corp.

**406:**
ELECTRIC CONTROL DEVICES catalogued. Ward Leonard Electric Co.

**407:**
EVAPORATIVE COOLING FANS; leaflet covering principle of operation, economies of installations and operation, fan assemblies and motors. Wagner Electric Corp.

**408:**
WIRE AND CABLE MANUAL designed to provide electrical engineers, contractors, etc. with data and specifications on wire products. United States Rubber Products, Inc.

**409:**
METAL-ENCLOSED SWITCHGEAR; types, specifications, connection diagrams and dimensions, general information. Delta-Star Electric Co.

**410:**
LIGHTING UNITS for commercial purposes described in three leaflets. Westinghouse.

**411:**
HIGH TENSION BUSHING FAULTS investigated and described in reprinted article. Roller-Smith Co.

**412:**
AUTOMATIC SERVICE RESTORERS for rural distribution lines; equipment fully described and illustrated. Pacific Electric Mfg. Corp.

**413:**
ELECTRIC-DRIVEN, DIRECT-CONNECTED COMPRESSORS; 56-page illustrated catalogue giving all necessary information. Ingersoll-Rand Co.

**414:**
BUILT-IN BATHROOM HEATERS, two latest models, fully described and illustrated in catalogue sheet. Wesix Electric Heater Co.

# NEW PRODUCTS

## Gum-Base Varnish

Recommended for use on deep wound coils where thorough hardening is difficult to obtain is a new type of synthetic gum-base varnish developed by John C. Dolph Co. Use of the varnish eliminates the necessity for giving preliminary coats a long bake before applying another coat. Dielectric strength is over 1,400 volts per mil.

●

## Electric Toothbrush

Approved by the Underwriters Laboratories, Inc., is the new Motodent Electric Toothbrush. The brush, which follows the same movements stressed by dentists, oscillates (7,200 times a minute) over a short arc. This brush, mounted in a round socket at the end of the mechanism's arm, can be snapped in or out of position for cleaning or replacement.

●

## Sight-Saving Lamp

Save Electric Corp. has developed a new incandescent lamp named "Natural White Sight-Saving Lamp," for use in homes, schools, shops, offices. Available in sizes from 10 to 300 watts, the lamp is said to obviate the need of shades, reflectors or other light distributing devices.

●

## Dual Range Clip-on Ammeters

Addition of three new dual range combination clip-on ammeters has enlarged Ferranti Electric's line to ten instruments ranging from 7.5 to 1,500 amp.

## Electric Blanket

Developed by General Electric is a lightweight wired comforter which takes the place of heavy blankets. Constant temperature is maintained by the unit through a thermostat operating a micromatic switch which turns current on or off as room temperature increases or decreases. Control range is 63 deg. F. The blanket is especially suitable for sick people.

●

## Pole Reenforcement

Pole reenforcement which may be used repeatedly and which may be quickly and cheaply installed is offered by Eastern Malleable Iron Co. Device consists of a 5-ft. 6-in. malleable iron stake support which fits snugly against the pole body and is bound to it by a steel band or clamped with steel clamps. About four feet of the support are driven below ground.

●

## Squirrel-Cage Motors

A line of explosion-proof, squirrel-cage a.c. motors with mounting dimensions conforming to N.E.M.A. standards has been announced by Reliance Electric & Engr. Co. The motors have been approved by the Underwriters' Laboratories for use in locations where flammable volatile liquids, etc., are made or stored. All working parts are enclosed; housing is said to be strong enough to withstand an internal explosion; rotors are integrally cast.

●

## Automatic Fuse

By automatically reducing its rating a short time after current has started to flow, the "Robot SOS" fuse, announced by Champion Electric Fuse Co., allows motor-starting currents of 400-per-cent normal but affords protection at much lower ratings thereafter. A thermal-expansion element within the standard-size, ferrule-type case, effects the change. Also offered is a model which, in addition, will close a signalling circuit, permitting visual or audible alarm, when current reaches 125 per cent of normal. At 150 per cent the fuse volatilizes. Fuses and renewal links, approved by Underwriters' Laboratories, are available in 5 to 60-amp. rating, 250 volts.

●

## Pin-Type Insulator

Announced by Westinghouse is a radio interference-proof pin-type insulator for power and distribution lines. To achieve this a metalized crown and a high resistance glaze with copper oxide as a base are employed. According to Westinghouse tests, a copper oxide insulator of conventional shape on power lines up to 45 kv. generates a signal barely detected by the most sensitive laboratory equipment. At 66 kv., untreated post-type insulators showed a 500-microvolt noise level at normal voltage to ground; an oxide glazed unit showed no interference at normal voltage, 15 microvolts at 115 per cent voltage, and 50 at 175 per cent.


FORGED-IN STRENGTH

BURNDY SERVIT

BURNDY ENGINEERING CO., INC.

● REPRESENTED BY:
Condon & Young, Los Angeles, Cal.
C. E. Ingalls, San Francisco, Cal.
Peterson Co., Denver, Colo.
F. W. Carlson, Seattle, Wash.

THE SAFE ANCHOR FOR R. E. A. CONSTRUCTION!

For long life and economy in annual maintenance cost, Everstick Anchors are first choice in rural electrification construction. Their safety and dependability have been proven on millions of miles of electric lines.

ANCHORS FOR EVERY PURPOSE

The complete line of Everstick Anchors offers three expanding types in a complete range of sizes and holding capacities. Also rigid type Cone Anchors in all sizes. Made of malleable iron with its properties of strength, elasticity and rust resistance. Write for new bulletin "Everstick For Rural Electrification."

The Everstick Anchor Co. ☆ FAIRFIELD, IOWA

### Four-Step Booster Regulator

Primarily for rural lines, Westinghouse has introduced a four-step booster-regulator, outdoor type, for either pole or platform mounting. It provides a boost of 10 per cent in 2½-per-cent steps, or 10-per-cent buck in the same steps during high-voltage periods. It is surge-protected with De-ion gaps. Control with reset timing relays is adjustable from 10 sec. to 50 min. Tap changer and transformer are in separate compartments easily accessible by removing the top cover.

●

### Electric Metallic Tubing

Claimed by National Electric Products Corp. is an exclusive process for making its new Xduct Junior, an electric metallic tubing zinc-coated by an electro-plating method. The tube may be bent, precise control of zinc thickness keeping the deposit thin enough to assure adherence.

●

### Electric Fans

Twelve new ratings have been added to the Wagner Electric Corp. line of electric fans. These include: 12- and 16-in. pedestal-type fans; 24- and 30-in. one and two speed, direct current, 3-blade circulators; 12-in. two-speed exhaust fan; 36-in. 4-blade, one and two speed, reversible and non-versible ceiling fans; 10-in. wall-box ventilator, and 9-in. reversible ventilating fan and wall-box.

●

### Bakelite Outlet Boxes

Outlet boxes are being produced in Bakelite molded by the Union Insulating Co. for use with non-metallic sheathed and CNX type cable wiring and in all places where corrosive fumes are present. Particularly recommended wherever salt or moist air is present, the boxes are provided with knockouts which can easily be removed for cable entrances.

●

### Light-Duty Network Protector

New light-duty network protector, built by Westinghouse, has carrying capacities of 225 or 600 amp. and a breaker interrupting capacity rated at 10,000 amp. The breaker is of the standard AB De-ion type. The breaker handle is driven by a small motor. Relays are similar to those used with heavy-duty protectors. Installation may be made on poles or underground, directly on the transformers or separately.

●

### Residence Type Switches

Designed for the small home market are the new residence type interchangeable switches announced by Bryant Electric Co. The units have enclosed Bakelite bodies; self-aligning bronze contacts and arc snuffing barriers. Rating is 10 amp.

●

### 500-Watt Bi-Post Lamp

A 500-watt bi-post lamp designed to fill the need of a high-wattage light source of extremely small size has been announced by both Westinghouse and General Electric. Both lamps are inside-frosted and smaller than the standard lamp, and can be burned either base up or base down. Longer life is claimed for both.

●

### Cable Ripper

For use on non-metallic, sheathed duplex metals is a new cable ripper, introduced by Ideal Commutator Dresser Co., which rips cables with one motion without danger of cutting the wires. Ripper is squeezed on to cable and pulled, thus ripping the cable without gouging. Device can also be used on the outer sheating of other cords, lead cable, etc., where outside diameter is ⅝ in. or less.

●

### Air Conditioner

An adjustable rotary grille which diffuses the conditioned air through the room to meet individual preferences and room characteristics is the main talking point of the new portable "Yorkaire" conditioner introduced into the field by York Ice Machinery Corp.

### Brown-Colored Tape

New kind of tape, known as "Slipknot brown," has been announced by Plymouth Rubber Co. Represented by the manufacturer as the first basic improvement in the tape industry in many years, the tape is a natural brown color closely approximating the color of the raw rubber used as its base. Claimed for the product is longer life than any existing commercial tape.

●

### Silent Switch

Placed in production by General Electric is a new silent mercury switch which, according to claims, has nothing to wear out. There is no spring to be broken, blades to hammer away. Actual switching element is composed of two metal disks sealed with glass completely enclosing the mercury make-and-break of the switch. Switch can be installed in any standard box.

●

### Downlight Luminaires

New series of aluminum downlight luminaires for use in interiors requiring a high intensity of downward light on material displayed below has been developed by F. W. Wakefield Brass Co. Intensities up to 75 ft.-candles can be obtained with the equipment. Units come in five styles, two recessed, two for application directly on ceiling and one suspended. Diameter of louver opening in all cases is 10¾ in.

●

### Oscillating Fan

Developed by Emerson Electric Mfg. Co. is a 12-in. overlapping blade oscillating fan on an adjustable floor stand. Fan, finished in mahogany lacquer, is adjustable from 3 ft. 3 in. to 4 ft. 9 in. Three-speed sliding switch is located in the base.

●

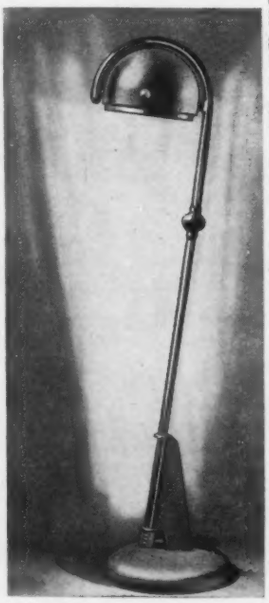
### Electric Timer

For use either in kitchens or in other locations where accurate but simple timing is mandatory is General Electric's new electric "kitchen timer." To set the time, alarm knob is turned until a red pointer indicates the desired interval. Any operation up to 3½ hr. may be timed.

●

### Sun Lamps

Life Lite is the name of a line of clock-controlled, ultra violet lamps manufactured by Ultra-Violet Products, Inc. Using a quartz tube, the lamp is said to supply greater percentages of ultra violet rays than any ordinary lamp. Measurement of the intensity of the various wave lengths of the lamps shows that over 92 per cent of the total energy is ultra violet energy; the rest is visible heat and light. A variety of floor, table and portable models is available (see cut). Accent is placed, however, on the compact, 2-lb. portable models which are held in the hand during treatment.



**CHROMALOX**

*Super-Speed*

**RANGE UNITS**

**Range builders like them because they sell ranges . . . Power companies like them because they build load . . . Housewives like them because they cook faster. Fine for replacement, too—they fit all ranges.**

Represented by

**MONTGOMERY BROTHERS**
911 Western Ave., Seattle, Wash.
1501 N. W. Kearny St., Portland, Ore.
61 Fremont St., San Francisco, Calif.
912 E. Third St., Los Angeles, Calif.

**THE PETERSON COMPANY**
1921 Blake St., Denver, Colo.

**EDWIN L. WIEGAND CO.**
7540 Thomas Blvd. Pittsburgh, Pa.

**PROFESSIONAL SERVICES**

**ELECTRICAL TESTING LABORATORIES**
**Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory.**
**80th St. and East End Ave., New York**

**Classified Section**

● **COST of undisplayed classified ads is 5 cents a word, minimum $1.00 insertion. Box numbers in care of our San Francisco office count as 10 words additional in undisplayed ads.**

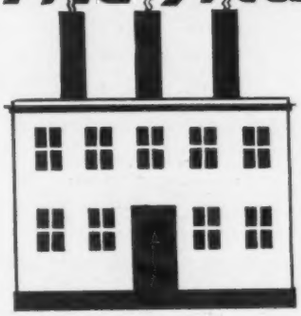
● **RATES per column inch of displayed ads is $3.75.**

● **All classified ads are payable in advance.**

**ELETCRICAL WEST** **883 Mission Street San Francisco, Calif.**

**Wanted:** Horizontal hydraulic turbine, approximately 2,000 hp., effective pressure 110 lb., with or without generator. Good condition. Address Box 150, Electrical West, 883 Mission St., San Francisco, Calif.

# The Manufacturers' Directory



● In these pages is a directory of electrical manufacturers, their Western offices and Western representatives—a valuable source of buying information to the subscribers of ELECTRICAL WEST. It is as accurate and complete as the publishers could make it; no charge is made for a listing and every manufacturer operating in this territory is privileged to be included. ELECTRICAL WEST does not guarantee the information, however, and assumes no responsibility for errors or omissions. Subscribers are respectfully requested to notify the publishers of any corrections or additions that should be made.

● Under each manufacturer are listed the Western branch offices or representatives. Where such information is not listed, the manufacturer has no representation in the territory or has reported none. If the distribution of a product is through wholesalers only, this also is indicated. To use the directory, find the manufacturer's listing and call upon the nearest branch office or agent. If the name of the manufacturer is not known, turn to the "Where to Buy It in the West" guide immediately following and look under the name of the product in which you are interested.

**American Transformer Co.**
178 Emmett St.
Newark, N. J.

*Industrial Transformers*
*Testing Sets*
*Voltage Regulators*

REPRESENTATIVES
H. B. Squires Co. 1277 Howard St. San Francisco
Jos. D. Sinnott 1203 Western Ave. Seattle, Wash.
J. L. Hansen University Bldg. Denver, Colo.

ABOLITE REFLECTOR CO., West Lafayette, Ohio—Jos. Paulson, Portland; H. J. Kjaer, San Francisco; W. E. Welborne, Los Angeles; W. E. Young, Denver.

ACCURATE MFG. CO., Garfield, N. J.—F. J. Airey Co., Los Angeles; Frank D. Fagan Co., San Francisco.

ADAM ELECTRIC CO., FRANK, St. Louis, Mo.—Zinsmeyer, Inc., Los Angeles; Fred E. Staible, Inc., Denver; Wm. R. Miller, Albuquerque.

AINSWORTH LIGHTING, INC., New York City. — Montgomery Bros., Seattle, Portland, San Francisco, Los Angeles.

AJAX ELECTROTHERMIC CORP., Trenton, N. J.—E. A. Wilcox Co., San Francisco; J. Max Lee Co., Los Angeles.

ALLEN-BRADLEY CO., Milwaukee, Wis.—Garland-A folter Eng. Corp., Seattle, San Francisco; Zinsmeyer, Inc., Los Angeles; Peterson Co., Denver.

ALLIANCE MFG. CO., Alliance, Ohio—D. L. Herman, Seattle; Gillan Sales Co., San Francisco, Los Angeles, Denver.

ALLIED MERCANTILE CO., THE, Irvington, N. J.—C. R. Hunt, San Francisco.

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. — Western Branch Offices: Spokane, Medford, El Paso. Western District Offices: Seattle, Portland, San Francisco, Los Angeles, Denver, Salt Lake City, Phoenix.

ALUMINUM COMPANY OF AMERICA, Pittsburgh, Pa.—Sales Offices: Seattle, San Francisco, Los Angeles, Denver.

AMERICAN AUTOMATIC ELECTRIC SALES CO., Chicago, Ill.—District Offices: San Francisco, Los Angeles.

AMERICAN BLOWER CORP., Detroit, Mich.—Branch Offices: Seattle, Tacoma, Portland, San Francisco, Los Angeles, Salt Lake City, Denver.

AMERICAN BRASS CO., Waterbury, Conn.—A. W. Gruss, Dist. Mgr., San Francisco.

AMERICAN ELECTRIC CABLE CO., Holyoke, Mass.—Detsch & Co., San Francisco.

AMERICAN FELT CO., Chicago, Ill.—F. J. Klenck Co., Seattle, Portland, San Francisco, Los Angeles.

AMERICAN PHENOLIC CO., Chicago, Ill. — Don H. Burcham, Portland; J. P. Hermans, San Francisco.

AMERICAN STEEL & WIRE CO., Cleveland, Ohio—Columbia Steel Co., Seattle, Portland, San Francisco, Los Angeles.

AMERICAN TRANSFORMER CO., Newark, N. J.—Jos. D. Sinnott, Seattle; H. B. Squires Co., San Francisco; C. R. Lynch, Los Angeles; J. Ludvig Hansen, Denver.

ANACONDA WIRE & CABLE CO., New York City—Branch Offices: Seattle, San Francisco, Los Angeles, Denver, Dallas.

ANACONDA WIRE & CABLE CO. OF CALIFORNIA—Leading Wholesalers in all principal cities.

ANCHOR WEBBING CO., Pawtucket, R. I.—Marwood Limited, Seattle, Portland, San Francisco, Los Angeles.

ANDERSON BRASS WORKS, INC., Birmingham, Ala.—Waltham, De Witt & Krusi, San Francisco; Industrial Eng'g. & Equip. Co., Los Angeles.

ANGELUS CHIMES CO., Los Angeles, Calif.—Frank D. Fagan Co., San Francisco.

APEX MFG. CO., Oakland, Calif.

APEX ROTAREX MFG. CO., Oakland, Calif.—Branch Offices: Seattle, Los Angeles, Denver; Harper-Meggee, Inc., Spokane, Portland; Home Elec. Co., Tacoma; Radio Studios, Salt Lake City.

APPLETON ELECTRIC CO., Chicago, Ill.—Branch Offices: San Francisco, Los Angeles; R. J. Lidgate, Seattle.

ARCO CO. OF CALIFORNIA, Los Angeles, Calif.—Insulating varnish only, Marwood Limited, Seattle, Portland, San Francisco, Los Angeles.

ARROW-HART & HEGEMAN ELEC. CO., The, Hartford, Conn.—District Offices: San Francisco, Los Angeles.

ASHEVILLE MICA CO., Biltmore, N. C.—Marwood, Ltd., Seattle, Portland, San Francisco, Los Angeles.

ATWOOD & MORRILL CO., Salem, Mass.—Ray Smythe, Portland; Oliver B. Lyman, San Francisco; A. W. Anderson, Los Angeles.

AUTOMATIC ELECTRIC CO., Chicago, Ill.—Branch Offices: Seattle, San Francisco, Los Angeles.

AUTOMATIC ELEC. MFG. CO., Mankato, Minn.—Jack E. Way and Garland-Affolter Eng'g Corp., Seattle; R. B. Clapp, Los Angeles.

AUTOMATIC WASHER CO., Newton, Ia.—Ben Franklin Elec. Co., Seattle; S. J. McCormick Co., Portland; Hughes & Co., Spokane, Billings, Great Falls; Jordan & Co., Los Angeles; Robt. F. Clark Co., Denver; Western Supply Co., Salt Lake City.

BABCOCK & WILCOX CO., New York City—C. C. Moore & Co., Seattle, Portland, San Francisco, Los Angeles, Phoenix; Harry Y. Byers, Denver.

BARKELEW ELECTRIC MFG. CO., Middletown, Ohio—Electrical Specialty Co., Seattle, San Francisco, Los Angeles.

BARTLETT MFG. CO., Detroit, Mich.—Geo. E. Honn Co., San Francisco; Joslyn Co. of Calif., Los Angeles; Line Material Co., Leading Wholesalers.

BARTLETT HAYWARD DIV., KOPPERS CO., Baltimore, Md.—F. W. Stevens, Portland; Oliver B. Lyman, San Francisco; A. W. Anderson, Los Angeles,; Shubart & Schloss, Denver.

BARTON CORP., THE, West Bend, Wis.—H. W. Randall, Div. Mgr., Oakland; Harry Oster & Co., Los Angeles.

BELDEN MFG. CO., Chicago, Ill.—Wallace R. Lynn Co., San Francisco.

BENJAMIN ELECTRIC MFG. CO., Des Plaines, Ill.—Miles F. Steel, Western Div. Sales Mgr., San Francisco. District Offices: Seattle, San Francisco, Los Angeles, Salt Lake City.

**BENJAMIN**
**LIGHTING**
**EQUIPMENT**
**FLOODLIGHTS**
**SIGNALS**
**FITTINGS & SOCKETS**
*Write for Catalog No. 26*
**BENJAMIN ELECTRIC MANUFACTURING Co.**
**DES PLAINES, ILLINOIS**
**Western Division Sales Office**
**San Francisco, California**
*Benjamin products are distributed exclusively through Electrical Wholesalers.*

BETTS & BETTS MFG. CO., New York City—Panama Lamp & Com'l. Co., San Francisco; Rapid Appliance Co., Los Angeles.

BIDDLE CO., JAMES G., Philadelphia, Pa.—Quality Electric Co., Ltd., Los Angeles.

BLACKBURN PRODUCTS CORP., JASPER, St. Louis, Mo.—Geo. E. Honn Co., San Francisco; W. W. Kirk Co., Los Angeles; L. Vernon Wilson, Phoenix.

BLACKBURN SPECIALTY CO., Cleveland, O.—H. B. Squires Co., Seattle, San Francisco, Los Angeles.

BLACKSTONE MFG. CO., INC., Jamestown, N. Y.—Bon Marche, Seattle; Dohrmann Com'l Co., San Francisco; Geo. S. Conley, Denver; Hansen Distr. Co., Salt Lake City.

BOSS WASHING MACHINE CO., Cincinnati, Ohio—Domestic Appliance Co., Seattle; Gordon E. Wilkins Co., Oakland.

BOWIE SWITCH CO., San Francisco, Calif.—Thomas S. Wood, Seattle; R. M. Small, San Francisco; W. D. Howze, Los Angeles; Paul A. Douden & Co., Denver.

BRANNON INCORPORATED, Detroit, Mich.—C. W. Thode, Los Angeles.

BREWER-TITCHENER CORP., THE, Cortland, N. Y. — Sold through insulator mfrs.

BRIGHT LIGHT REFLECTOR CO., Brooklyn, N. Y.—Northwest Sales Co., Portland; I. H. Pope Co., San Francisco, Oakland; J. G. Kirkpatrick, Los Angeles; R. F. Hamilton, Denver.

**Apex** WASHERS • CLEANERS
REFRIGERATORS • IRONERS
DENVER, COLO. SEATTLE, WASH. SALT LAKE CITY
PORTLAND, ORE. BOISE, IDAHO LOS ANGELES, CAL.
**Apex Rotarex Mfg. Co., Oakland, Calif.**

**BOWIE SWITCHING EQUIPMENT**
*"Made in—and for the West"*
Outdoor Substation Equipment . . Cutouts . . Fuses . . Copper Fittings . . Automatic Cutouts . . Busbar Supports . . Indoor Station Equipment . . Fixed Gap Ammeter
**Bowie Switch Co. - - - - 815 Tennessee, San Francisco**

BRIGHT STAR BATTERY CO., Clifton, N. J.—L. B. Lamar, Seattle; F. W. Lawson, San Francisco.

BRISTOL COMPANY, THE, Waterbury, Conn.—R. G. Tower, Pacific Coast Manager, San Francisco. Branch Offices: Seattle, San Francisco, Los Angeles.

BROWN COMPANY, New York City—Earl Van Pool, Dist. Mgr., San Francisco; Westinghouse Elec. Supply Co., all principal cities; Electric Supplies Dist. Co., San Diego.

BROWNING MFG. CO., Maysville, Ky.—Marwood Limited, Seattle, Portland, San Francisco, Los Angeles; Electric Motor Shop, Fresno.

BRYANT ELECTRIC CO., THE, Bridgeport, Conn.—H. E. Sanderson, Dist. Mgr., San Francisco; Western Reprs: F. C. Scharr, Seattle; K. B. Van Bergen, San Francisco; H. D. Burns, Los Angeles; Robert L. Gill, Huntington Park, Calif.

BUCKINGHAM, W. H., Binghamton, N. Y.—Western Hardware & Tool Co., San Francisco.

BULL DOG ELECTRIC PRODUCTS CO., Detroit, Mich.—Coast Electric & Mfg. Co., Portland; Safety Switchboard & Mfg. Co., San Francisco; Mullenbach Elec'l. Mfg. Co., Los Angeles.

BULLARD CO., E. D., San Francisco, Calif.—Branch Offices: Seattle, Los Angeles, Salt Lake City, Houston.

BURDICK CORP., THE, Milton, Wis.—Al Bush Elec. Co., San Francisco; Kelly-Koett X-Ray Co., San Francisco, Los Angeles.

BURGESS BATTERY CO., Freeport, Ill.—District Offices: Portland, Denver; Dan J. Rudat, San Francisco; V. T. Rupp, Los Angeles.

BURKE ELECTRIC CO., Erie, Pa.—Burton R. Stare, Seattle; Oliver B. Lyman, San Francisco; Otto Demmert, Los Angeles.

BURNDY ENGINEERING CO., New York City.—F. W. Carlson, Seattle; C. E. Ingalls, San Francisco; Condon & Young, Los Angeles; Peterson Co., Denver.

BURNLEY BATTERY & MFG. CO., North East, Pa.—Joslyn Co. of California, San Francisco, Los Angeles.

BUSSMANN MFG. CO., St. Louis, Mo.—A. J. Cole. Pacific Coast Mgr., Los Angeles; District Offices: Seattle, San Francisco, Los Angeles.

CALIFORNIA CORRUGATED CULVERT CO., Los Angeles, Berkeley, Calif.—Washington Corrugated Culvert Co., Seattle, Spokane; Pure Iron Culvert Mfg. Co., Portland; The R. Hardesty Mfg. Co., Denver, Salt Lake City, Albuquerque; Western Metal Mfg. Co., Phoenix.

CANNON ELEC. DEVELOPMENT CO., Los Angeles, Calif.—James J. Backer Co., Seattle; H. H. Van Luven (signal and power equip.) Los Angeles; Graybar Elec. Co., (sound equip., cable connectors), Los Angeles.

CARBOLOY CO., Detroit, Mich.—Sales Representatives: Fred Robbins, Portland; J. W. Doody, Los Angeles.

CENTURY ELECTRIC CO., St. Louis, Mo.—Branch Offices: Seattle, Spokane, San Francisco, Los Angeles, Denver, Salt Lake City, Dallas, Houston.

CHANCE CO., A. B. & TIPS TOOL CO. (Div. of A. B. Chance Co.), Centralia, Mo. — Joslyn Co. of Calif., Los Angeles, San Francisco; Hubbard and Company, General Elec. Supply Corp., Westinghouse Elec. Supply Co., San Francisco; Utilities Supply Co., Los Angeles.

CHAPMAN VALVE MFG. CO., THE, Indian Orchard, Mass.—Branch Offices: San Francisco, Los Angeles.

CHASE BRASS & COPPER CO., INCORPORATED, Waterbury, Conn.—Branch Offices: Seattle, San Francisco, Los Angeles; Maydwell & Hartzell, Inc., San Francisco, Los Angeles, Portland.

CHESLER & SONS CO., J., Brooklyn, N. Y.—O. W. Coombs Sales Co., Los Angeles.

CHICAGO FLEXIBLE SHAFT CO., Chicago, Ill. — District Offices: Seattle, Los Angeles, Salt Lake City.

CHICAGO PNEUMATIC TOOL CO., New York City—H. P. Hansen, Mgr., San Francisco.

CHICAGO SIGNAL CO., THE, Chicago, Ill.—Garnett Young & Co., Seattle, San Francisco, Los Angeles.

CINCINNATI ELEC. TOOL CO., Cincinnati, Ohio—Fred E. Wising, San Francisco.

CIRCLE F MFG. CO., Trenton, N. J.—Gillette & McLaren, Inc., Seattle, Portland; Keeler, White Co., San Francisco; A. W. Bromberg, Los Angeles.

CLARK CONTROLLER CO. (Sundh Elec. Co.), Cleveland, O.—Burton R. Stare, Seattle; Oliver B. Lyman, San Francisco; Mullenbach Elec'l Mfg. Co., Los Angeles; Bull Dog Mfg. Co., Denver.

CLEMENTS MFG. CO., Chicago, Ill.—D. E. Sanford Co., Seattle, San Francisco, Los Angeles.


★ SAUTER ★
Time Switches
Synchronous Motor
Electrically Wound
A Type for Every
Time Switch Application
Represented by
Maydwell & Hartzell
San Francisco
Associated Sales Engineers
Los Angeles


CLIFTON CONDUIT CO.—Hatheway & Co., Distributors, New York City—Northwestern Agencies, Seattle; Northwest Sales Co., Portland; Jas. J. Noble Co., San Francisco; Electric Sales Co., Los Angeles.

CLIFTON MFG. CO., Boston, Mass. — Albert S. Knight Co., Seattle; Geo. E. Honn Co., San Francisco; Bacon - Cooper Co., Denver.

CLIPSHAVE, INC., Port Chester, N. Y.—C. C. Smoot Co., San Francisco.

COHOES ROLLING MILL CO., Cohoes, N. Y.—Branch Office, Los Angeles.

COLE & CO., INC., C. W., Los Angeles, Calif.—R. S. Prussia, San Francisco; RA-O-LITE Co., Ltd., Honolulu.

COLONIAL PREMIER CO., Chicago, Ill.—John Maddox, San Francisco.

COLT'S PATENT FIRE ARMS MFG. CO., Hartford, Conn.—The Frank H. Bran Co., San Francisco, Los Angeles.

COLUMBIA ELEC. MFG. CO., Cleveland, Ohio.—Geo. E. Honn Co., San Francisco.

COMMERCIAL ENCLOSED FUSE CO., Hoboken, N. J.—Geo. H. Curtiss Co., San Francisco; Rosse M. Gilson, Los Angeles.

COMMONWEALTH ELECTRIC & MFG. CO., Boston, Mass.—Montgomery Bros., Seattle, Portland, San Francisco, Los Angeles.

CONSOLIDATED LAMP WORKS, Lynn, Mass.—Panama Lamp & Com'l Co., San Francisco, Los Angeles.

CONTINENTAL-DIAMOND FIBRE CO., Newark, Del. — Marwood Limited, San Francisco; Farnham & Cunningham, Los Angeles.

COPE, INCORPORATED, T. J.—Geo. E. Honn Co., San Francisco.

COPPERWELD STEEL COMPANY, Glassport, Pa.—C. E. Ingalls, San Francisco.

CORNELL - DUBILIER ELECTRIC CORP., Power Factor Division, So. Plainfield, N. J.—Tinling & Powell, Spokane; Ray Smythe, W. J. Cottrell, Portland; Geo. E. Honn Co., Paul S. Everley, San Francisco; W. C. King, Los Angeles; M. G. Mueller, Denver; J. E. Redmond, Phoenix; Eyler-Greenawalt & Co., El Paso.


★ GEO. E. HONN CO.
420 Market Street
San Francisco, Calif.

PRODUCTS THAT ARE DEPENDABLE
LOCAL STOCKS • PROMPT SERVICE

★ Manufacturers' Representative For:

PYREX INSULATORS
BREWER-TITCHENER HARDWARE
• Corning Glass Works

FUSES, CUTOUTS, DISCONNECTS, PROTECTIVE DEVICES
• Schweitzer & Conrad, Inc.

CAPACITORS
• Cornell-Dubilier Corp.
World's Largest Exclusive Mfrs. of Capacitors

TRANSFORMERS
• Gardner Electric Mfg. Co.
Power and Distribution Transformers
• Lee Skipwith & Co., Inc.
Niagara Air-Insulated Current Transformers

CABLE GRIPS
• Kellems Products, Inc.

CONNECTORS, GROUND ROD CLAMPS, UTILITY HOISTS
• Jasper Blackburn Products Corp.

GROUND LINE POLE TREATMENT
• Osmose Corp. of America

METERING INSTRUMENTS
• Landis & Gyr, Inc.

CROMPTON TONG TEST AMMETER
• Columbia Electric Mfg. Co.

UNDERGROUND TOOLS & EQUIPMENT
• T. J. Cope, Incorporated

TREE TRIMMING EQUIPMENT
• Bartlett Manufacturing Co.

FRICTION AND RUBBER TAPES
• Clifton Manufacturing Co.



CADILLAC
VACUUM CLEANERS
"Today's Biggest Values"
D. E. SANFORD CO.
Western Distributors for CLEMENTS MFG. CO.
Chicago, Ill.
BRANCHES
SAN FRANCISCO 837 Howard Street
LOS ANGELES 656 So. Los Angeles
SEATTLE—Rm. 805 Terminal Sales Bldg.

**C. E. INGALLS**

*Factory Representative*

**403 RIALTO BLDG.**
**SAN FRANCISCO**


CORNING GLASS WORKS, Corning, N. Y.—Thos. S. Wood, Seattle; Geo. E. Honn Co., San Francisco; W. D. Howze Sales Co., Los Angeles; The Galigher Co., Salt Lake City; J. Q. Lalor, Denver; J. E. Redmond, Phoenix.

CRAMER & CO., R. W., New York City—Maydwell & Hartzell, Inc., San Francisco, Portland, Associated Sales Engineers, Los Angeles.

CRESCENT INS. WIRE & CABLE CO., Trenton, N. J.—Hodges & Glomb, San Francisco; Henger-Seltzer Co., Los Angeles.

CROCKER-WHEELER ELEC. MFG. CO., Ampere, N. J.—Branch Offices: San Francisco, Seattle.

CROUSE-HINDS CO., Syracuse, N. Y.—Sales Offices: Seattle, San Francisco, Los Angeles.

CRYSTALITE PRODUCTS CO., Glendale, Calif.—Maydwell & Hartzell, Inc., San Francisco, Los Angeles; Associated Wholesale Elec. Co., Elec'l Products Corp., Los Angeles; Smoot-Holman Co., Inglewood, Calif.; National Theatre Supply Co., principal cities.

CURTIS LIGHTING, INC., Chicago, Ill.—W. K. Turner, Seattle; R. M. Camnitz, Portland; John D. Erikson, Mill Valley, Calif.; Frank J. Airey Co., Inc., Los Angeles; G. S. Spangler, Denver.

CUTLER-HAMMER, INC., Milwaukee, Wis.—Branch Offices: Seattle, San Francisco, Los Angeles.

DAY-BRITE REFLECTOR CO., St. Louis, Mo.—Allied Industries, Inc., Seattle, Portland; John D. Erikson, San Francisco; Illuminating Co., Los Angeles; Fred E. Staible, Inc., Denver.

DE LAVAL SEPARATOR CO., New York City—De Laval Pacific Co., San Francisco.

DELTA ELECTRIC CO., Marion, Ind.—Wallace R. Lynn Co., Seattle, San Francisco, Los Angeles.

DICKE TOOL CO., Downers Grove, Ill.—Maydwell & Hartzell, Inc., San Francisco, Los Angeles, Portland.

DIEHL MANUFACTURING CO., Elizabethport, N. J.—H. B. Squires Co., Seattle, San Francisco; E. Zinsmeyer, Los Angeles.

DOLPH CO., JOHN C., Newark, N. J.—Joslyn Co. of Calif., San Francisco, Los Angeles; Leonard S. Foley, Portland; Urquhart Service, Denver, Salt Lake City.

DOMINION ELEC'L. MFG. CO., Mansfield, O.—T. R. Sledding, Seattle; Wm. P. Horn Co., San Francisco; J. R. Shipp, Los Angeles.

DONGAN ELECTRIC MFG. CO., Detroit, Mich.—Preferred Equipment Co., Seattle; H. H. Van Luven, Los Angeles.

DRIVER CO., WILBUR B., Newark, N. J.—Marwood Ltd., Seattle, Portland, San Francisco, Los Angeles.

DRIVER-HARRIS CO., Harrison, N. J.—John A. Roebling's Sons Co., Seattle, Portland, San Francisco, Los Angeles.

DUNCAN ELEC. CO., Lafayette, Inc.—Eicher & Bratt, Seattle; A. F. Blecksmith, Los Angeles; Paul A. Douden, Denver; H. E. Holland, Salt Lake City.

DURAKOOL, INC., Elkhart, Ind.—Gillette & McLaren, Seattle; H. E. Fricke, Seattle; C. R. Hunt, San Francisco; Geo. Colton, Oakland.

EASY WASHING MACHINE CORP., Syracuse, N. Y.—F. S. Fenton, Jr., Dist. Mgr., San Francisco.

EDISON, INC., THOMAS A., Orange, N. J.—Branch offices: Seattle, San Francisco, Los Angeles; Denver, Salt Lake City.

EDISON GENERAL ELEC. APPLIANCE CO., INC., Chicago, Ill.—Branch Offices: Seattle, San Francisco, Los Angeles.

EDWARDS AND COMPANY, INC., Norwalk, Conn.—F. A. Strobecker, Seattle; Geo. A. Gray Co., San Francisco; J. G. Pomeroy Co., Los Angeles; Bacon-Cooper Co., Denver; O. T. Jenkins Co., Dallas.

ELECTRIC AIR HEATER CO., Mishawaka, Ind.—Fred W. Carlson, Seattle; Wm. Moon, Oakland; Harry E. Haldeman, Inc., Los Angeles.

ELECTRIC CONTROLLER & MFG. CO., THE, Cleveland, O.—J. C. McDougall, Seattle; E. B. Morrill, San Francisco; Thomas Machinery Co., Los Angeles; J. B. Ambler, Denver; Riter Eng'g. Co., Salt Lake City.

ELECTRIC FURNACE CO., THE, Salem, Ohio—Thomas Machinery Co., Los Angeles.

ELECTRIC HEATER CO., THE, Bridgeport, Conn. — Clyde L. Chamblin Co., San Francisco.

ELECTRIC MACHINERY MFG. CO., Minneapolis, Minn.—W. C. King, West Coast Mgr., Los Angeles; H. S. Emanuels, Seattle; Ray Smythe, Portland, Salt Lake City; Paul S. Everley, San Francisco; Mark G. Mueller, Denver; Tinling & Powell, Spokane.

ELECTRIC POWER EQUIP. CORP., Philadelphia, Pa.—J. C. McDougall, Seattle; C. E. Ingalls, San Francisco; L. W. Thompson, Los Angeles; R. F. Hamilton, Denver; C. F. Cate, El Paso.

ELECTRIC PRODUCTS CO., THE, Cleveland, Ohio—Fred W. Carlson, Seattle; E. A. Wilcox Co., San Francisco; L. W. Thompson, Los Angeles.

ELECTRIC SERVICE SUPPLIES CO., Philadelphia, Pa.—Burton R. Stare, Seattle; Harry M. Euler Co., Portland; Dom Politeo, San Francisco; A. W. Arlin, Los Angeles; Franklin Sales Co., Denver; Electrical-Mechanical Engr. Material Co., Phoenix; L. Brandenburger, Salt Lake City.

ELECTRIC SPECIALTY CO., Stamford, Conn.—Electrical Specialty Co., Seattle, San Francisco, Los Angeles.

ELECTRIC SPRAYIT CO., THE, Milwaukee, Wis. — Fred Brumbaugh, Portland; Kelly-Duncan Co., San Francisco, Los Angeles.

ELECTRIC STORAGE BATTERY CO., THE, Philadelphia, Pa.—Branch Offices: Seattle, San Francisco, Los Angeles, Denver.

ELECTRIC VACUUM CLEANER CO., INC., Cleveland, O.—Premier Division Offices: San Francisco, Oakland, Los Angeles.

ELECTRICAL FACILITIES, INC., Oakland, Calif.—Thos. S. Wood, Seattle; A. F. Blecksmith, Los Angeles; Paul A. Douden & Co., Denver.

ELECTRO ACOUSTICS PRODUCTS CO., Fort Wayne, Ind.—L. H. Bushnell, San Francisco.

ELECTRO HOT HEATER CO., Tacoma, Wash.—Branch Offices: Seattle.

ELECTROLINE COMPANY, Chicago, Ill.—D. H. Lundin & Co., Seattle; W. D. Howze, Los Angeles; J. L. Hansen, Denver.

ELLIOTT COMPANY, Pittsburgh, Pa.—District Offices: San Francisco, Los Angeles.

ENAMELED METALS CO., Pittsburgh, Pa.—W. W. Wheat, Portland; J. G. Pomeroy Co., Los Angeles; Reichart Elec. Co., Houston.

ERSKINE GLASS & MFG. CO., Wellsburg, W. Va.—Western Glass Products Co., Tacoma, San Francisco, Los Angeles.

ESTATE STOVE CO., THE, Hamilton, O.—Branch Offices: Portland, San Francisco, Los Angeles.

ESTERLINE-ANGUS CO., THE, Indianapolis, Ind.—A. H. Cox & Co., Inc., Seattle; Geo. H. Hoffman, Portland; T. R. Routh Co., San Francisco; Quality Electric Co., Ltd., Los Angeles; Paul A. Douden, Denver; J. E. Redmond Co., Phoenix.

EUREKA VACUUM CLEANER CO., Detroit, Mich.—Branch Offices: Spokane, Portland, San Francisco, Los Angeles, San Diego, Denver, Salt Lake City.

EVERSTICK ANCHOR CO., THE, Fairfield, Ia.—National distributors of Pole Line Hdwe.

F. A. B. MANUFACTURING CO., Oakland, Calif.—Garland-Affolter Eng'g Corp., Seattle; Newton Electric Co., Portland; Condon & Young, Los Angeles.

FAIRBANKS, MORSE & CO., Chicago, Ill.—Branch Offices: Seattle, Portland, San Francisco, Los Angeles, Denver.

FAIRBANKS, MORSE & CO., Home Appliance Div., Indianapolis, Ind.—Warren Coutts, Dist. Mgr., San Francisco.

FARIES MFG. CO., Decatur, Ill.—P. D. Callahan, Los Angeles.

FERRANTI ELECTRIC, INC., New York City—Instruments: Burton R. Stare, Seattle; H. B. Squires Co., San Francisco, Los Angeles. Electronic Equipment; Merton A. Dobbin, Portland; Topping Radio Co., San Francisco; S. E. Shapiro, Los Angeles.

FIBRE CONDUIT CO., New York City—Graybar Electric Co., General Electric Co., all principal cities.

FIRE PROOF WALL CO., Oakland, Calif.

FITZGERALD MFG. CO., THE, Torrington, Conn.—Branch Office: Los Angeles.

FOLMER ELECTRACIDE CO., Rochester, N. Y.—Allied Industries, Inc., Los Angeles.

FOSTORIA PRESSED STEEL CORP., THE, Fostoria, Ohio—Marwood Limited, Seattle, Portland, San Francisco, Los Angeles.

FOWLER MFG. CO., Portland, Ore.

FRIGIDAIRE DIVISION, GENERAL MOTORS CORP., Dayton, O.—Roger G. Hutchison, Pacific Sales Mgr., San Francisco. Branch Offices: Seattle, Spokane, Portland, San Francisco, Oakland, Los Angeles, Salt Lake City.

FRINK CORP., THE, Long Island City, N. Y.—J. D. Sparks, Seattle; James Mundstock, San Francisco; H. C. Ross, Los Angeles; Thad J. Stevens, Salt Lake City.

GARDNER ELEC. MFG. CO., Emeryville, Calif.—Industrial Elec. Co., Seattle, Portland; Geo. E. Honn Co., San Francisco; Beeson Eng'g Co., Los Angeles; Kranefeld Eng'g Co., Denver; Modern Electric Co., Salt Lake City.

GAYNOR ELECTRIC CO., Bridgeport, Conn.—C. J. Gratiot & Sons, San Francisco, Los Angeles.

G. C. A. MFG. CO., Pittsfield, Mass.—Leading Wholesalers.

GEIER CO., THE P. A., Cleveland, O.—P. R. Conley, Seattle; E. N. Turnquist, Fair Oaks, Calif.

GEM ELECTRIC MFG. CO., New York City—Electric Sales Co., Los Angeles.

GENERAL CABLE CORP., New York City—Sales Offices: Seattle, San Francisco, Los Angeles, Dallas.

GENERAL ELECTRIC CO., Air Conditioning Dept., Bloomfield, N. J.—N. B. Dinkel, Dist. Mgr., San Francisco; R. U. Berry, Dist. Mgr., Dallas.

GENERAL ELECTRIC CO., Appliance & Mdse. Div., Bridgeport, Conn.—Geo. S. West, Dist. Mgr., San Francisco. Sales Offices: All principal cities.

GENERAL ELECTRIC CO., Lamp Division, Cleveland, O.—M. C. Hixson, Pacific Div. Mgr., San Francisco. District Offices: Portland, San Francisco, Los Angeles, Denver, Salt Lake City.


Dolph's

INSULATING VARNISHES AND COMPOUNDS

**J. C. Dolph Co.**

*Insulation Specialists*

168 Emmett St. Newark, N. J.

DISTRIBUTED BY
JOSLYN COMPANY OF CALIF.
5100 District Blvd., Los Angeles, Calif.
JOSLYN COMPANY OF CALIF.
180 Potrero Ave., San Francisco, Calif
URQUHART SERVICE
2162 Market St., Denver, Colorado
L. S. FOLEY
733 N. W. Everett St., Portland, Ore.



**TERRITORIES AVAILABLE**

Instantaneous, faucet-type electric water heater. Fast action—from cold to 140 degrees in 3 seconds. Adjustable. Ideal for factories, schools, roadside stands, cabins, etc., where hot water is needed at irregular intervals and cheapest cost. Hundreds of installations prove operating efficiency.

*San Francisco Distributor:*

**CLYDE CHAMBLIN CO.**

WRITE TO

The
**ELECTRIC HEATER COMPANY**
BRIDGEPORT, CONN.



*For All Underground Wiring Purposes . . .*

**SOAPSTONE DUCT**

FIRE PROOF WALL CO.

354 Hobart St. Oakland, Calif. GLencourt 9420



***Southern California and Arizona Representative***

**Electric Power Equipment Corp.**—Outdoor and Indoor Power Switching Equipment.

**Electric Products Co.**—Motor generator sets.

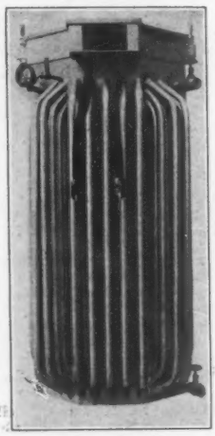
**Struthers-Dunn, Inc.**—Relays.

**L. W. THOMPSON** 912 E. THIRD STREET Los Angeles, Cal. MU 9076

## To Assure Dependability Specify Gardner Transformers

• You can rely upon Gardner Transformers to give complete satisfaction. They are designed and built of the finest materials available by transformer specialists with over 25 years experience.

For prompt delivery, investigate our stock of used, rebuilt or new transformers in all sizes and voltages. Our modern plant is equipped to build special transformers to meet most rigid specifications. Also to give speedy and economical repair service.

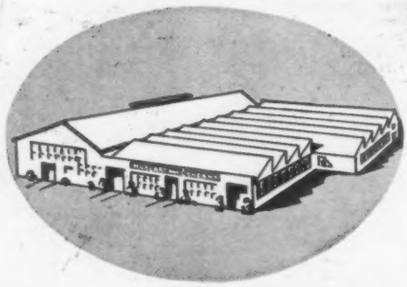


**GARDNER ELECTRIC MFG. CO.**

4227 Hollis Street — Emeryville, California

★ Solve Your Every Transformer Problem at Your Local Dealer.

REPRESENTATIVES: Geo. E. Hann Co., 420 Market St., San Francisco, Calif.; Beeson Engineering Co., 2501 E. 52nd St., Los Angeles, Calif.; Industrial Electric Co., 1304 Stewart St., Seattle, Wash.; Modern Electric Co., 37 Richards St. Salt Lake City, Utah; Kranefeld Engineering Co., 3416 14th Ave., Denver, Colo.



## "AN INTEGRAL PART OF THE ELECTRICAL INDUSTRY IN THE WEST"

**HUBBARD is proud that it is in a position to cooperate fully and serve the electrical industry.**

**Hubbard and Company is constantly alert to the needs of the electrical industry. Its factory at Oakland, California, is equipped to furnish a complete line of distribution hardware and construction specialties that are reliable and of guaranteed quality.**

**Its distributors, the Graybar Electric Co. and the General Electric Supply Corp. are conveniently located for prompt, efficient delivery of Hubbard Pole Line Hardware and Peirce Construction Specialties. To solve your special problems we invite you to call upon our experienced engineering department.**

**Hubbard and COMPANY**

PITTSBURGH • OAKLAND, CAL. • CHICAGO


GENERAL ELECTRIC CO., Machinery Manufacturers Section, Schenectady, N. Y.—J. A. Cranston, Commercial Vice President, San Francisco; R. M. Alvord, Mgr., Pacific Dist., San Francisco—Offices at San Francisco, Los Angeles, Phoenix. A. S. Moody, Mgr., N. W. Dist., Portland—Offices at Portland, Seattle, Spokane, Tacoma.

GENERAL ELECTRIC CO., Specialty Appliance Sales Div., Cleveland, O.—Geo. Ruck, Western Region Mgr., San Francisco. Sales Offices: All principal cities.

GENERAL ELECTRIC VAPOR LAMP CO., Hoboken, N. J.—Keese Eng'g Co., Los Angeles, San Francisco.

GENERAL ELECTRIC X-RAY CORP., Chicago, Ill.—H. D. Roop, Dist. Mgr., San Francisco. District Offices: Seattle, Spokane, San Francisco, Los Angeles, Salt Lake City.

GENERAL ELECTRIC SUPPLY CORP., San Francisco, Calif.—D. E. Harris, Vice Pres., San Francisco. Branch Offices: Seattle, Spokane, Portland, San Francisco, Oakland, Sacramento, Fresno, Los Angeles, Long Beach, San Diego, Denver, Butte, Phoenix.

GIBSON ELEC. REFRIGERATOR CORP., Greenville, Mich.—G. M. Lowman, Seattle; L. E. Taufenbach, Los Angeles; Henry Wolff Co., San Francisco.

GILBY WIRE CO., Newark, N. J.—Marwood Ltd., Seattle, San Francisco, Los Angeles.

GILFILLAN BROS., INC., Los Angeles, Calif.—H. E. Zobrist, Seattle; L. D. Heater Music Co., Portland; E. J. & Jack Totten, San Francisco; Intermountain Jobbers Supply, Salt Lake City.

GLASS COFFEE BREWER CORP., Chicago, Ill.—D. E. Sanford Co., Seattle; San Francisco, Los Angeles.

GLOBAR DIVISION OF THE CARBORUNDUM CO., Niagara Falls, N. Y.—Electric heating elements, Pacific Abrasive Supply Co., San Francisco; Radio resistors, Harry A. Lasure Co., Los Angeles.

GOULDS PUMPS, INC., Seneca Falls, N. Y.—For oil purifiers, W. P. Alexander, San Francisco; for pumps, Woodin & Little, Inc., San Francisco.

GRAYBAR ELECTRIC COMPANY, New York City—Branch Offices: Seattle, Spokane, Tacoma, Portland, San Francisco, Sacramento, Los Angeles, San Diego, Salt Lake City, Oakland, Fresno, Phoenix, Butte.

GREEN, INC., R. H., Oakland, Calif.—J. G. Pomeroy Co., Los Angeles.

GREENE ELECTRIC FURNACE CO., Seattle, Wash.

GREENLEE TOOL CO., Rockford, Ill.—J. B. Lippincott Co., Seattle, San Francisco, Los Angeles.

GREIST MFG. CO., THE, New Haven, Conn.—Fred C. Wood, Portland; Lewis Glassman, Los Angeles; R. F. Hamilton, Denver; Grover Moore, Fort Worth.

THE GRISWOLD MFG. CO., Erie, Pa.—W. F. Smith, Dist. Mgr., Los Angeles.

G & W ELEC. SPECIALTY CO., Chicago, Ill.—W. R. Hendrey Co., Seattle; C. E. Ingalls, San Francisco; Farnham & Cunningham, Los Angeles; Mountain States Machinery Co., Denver; Riter Eng'g. Co., Salt Lake City; F. W. Gorman, El Paso.

HAAG BROTHERS CO., Peoria, Ill.—Domestic Utilities, Inc., Seattle; J. W. Marsh, Los Angeles; Mountain States Implement Co., Ogden.

HAMILTON BEACH MFG. CO., Racine, Wis.—R. M. Saunders, Dist. Mgr., Los Angeles.

HAMMOND INSTRUMENT CO., Chicago, Ill.—Continental Sales Co., San Francisco, Los Angeles; C. H. Spencer, Salt Lake City; George E. Anderson Co., Dallas; The Southwestern Corp., Phoenix.

HANKSCRAFT COMPANY, Madison, Wis.—Erlach-Lee Co., San Francisco.

HARDWICK, HINDLE, INC., Newark, N. J.—J. G. Corrin, Los Angeles.

HARTMAN, B., Long Beach, Calif.

HART MFG. CO., THE, Hartford, Conn.—Pacific Elec. Distributors, Seattle; Frank L. DuFrane, San Francisco; H. H. Van Luven, Los Angeles.

HARVEY HUBBELL, INC., Bridgeport, Conn.—Grover A. Anderson, Dist. Mgr., San Francisco; A. M. McMillan, Dist. Mgr., Los Angeles.

HOLOPHANE CO., INC., New York City—Paul Davis, Seattle; Robt. G. Dummel, San Francisco; Frank van Gilluwe, Los Angeles.

HAZARD INS. WIRE WORKS DIV. of THE OKONITE COMPANY, Wilkes-Barre, Pa.—I. W. Borda, Pacific Coast Mgr., San Francisco. Branch Offices: Seattle, San Francisco, Los Angeles, Dallas.

HEMINGRAY GLASS DIVISION, Owens-Illinois Glass Co., Muncie, Ind.—Leading Wholesalers.

H D ELECTRIC CO., Chicago, Ill.—T. S. Wood, Seattle; L. A. Nott, San Francisco; H. W. Wittenberg, Los Angeles.

HENDERSON ELECTRIC CO., Ampere, N. J.—Geo. A. Gray Co., San Francisco; J. G. Pomeroy Co., Los Angeles.

HEXACON ELECTRIC APPLIANCE CO., Roselle Park, N. J.—Albert S. Knight Co., Seattle; Omer Cox Co., San Francisco; Associated Sales Engineers, Los Angeles.

HIGHLAND ELECTRO-CHEMICAL CO., Connellsville, Pa.—Myers & Schwarts, and C. W. Marwedel, San Francisco; Leading Wholesalers.

HIGH TENSION CO., Inc., THE, Phillipsburg, N. J.—Equipment Sales, Seattle; J. B. Ambler, Denver; Riter Eng'g. Co., Salt Lake City; Paul S. Everley, San Francisco.

HI-VOLTAGE EQUIPMENT CO., Cleveland, O.—J. G. Corrin, Los Angeles; Fred W. Carlson, Seattle.

HOLLAND RIEGER CORP., Sandusky, O.—S. W. Tarshis, Seattle; H. E. Williams, San Francisco.

HOLOPHANE CO., INC., New York City—Paul Davis, Seattle; Robt. G. Dummel, San Francisco; Frank van Gilluwe, Los Angeles.

HOOVER CO., THE, North Canton, O.—Branch Offices: Seattle, Los Angeles, Dallas.

HORTON MFG. CO., Fort Wayne, Ind.—General Sales Corp., San Francisco; Fey & Krause, Inc., Los Angeles; Hendrie & Bolthoff Mfg. & Supply Co., Denver; Albert Mathias & Co., Phoenix, El Paso.

HOWZE SALES CO., W. D., Los Angeles, Calif.

HUBBARD AND COMPANY, Pittsburgh, Pa.; Chicago, Ill.; Oakland, Calif.—W. W. Glosser, Vice Pres., Pacific Coast Div., Oakland; District Sales Offices: Portland, Los Angeles.


## INDUSTRIAL and COMMERCIAL LIGHTING

- Mercury, neon, sodium, argon and combination light sources.
- Practical light sources for inspection, culling, sorting and for all industrial operations, sterilizing, and weathering processes.
- Ultra Violet, Quartz lamps.
- Light filters, etc., etc.

GENERAL ELECTRIC VAPOR LAMP CO.

KEESE ENGINEERING CO., Agents
Hollywood — San Francisco

HULLHORST MICRO TOOL CO., Toledo, O.—Electric Agencies, Oakland; E. H. Bell, Los Angeles; Fairman B. Lee, Seattle.

HYGRADE SYLVANIA CORP., Salem, Mass.—E. P. Demarest, Dist. Mgr., Los Angeles; Arthur Detsch, Portland; J. R. McGinnis, Dallas.

IDEAL COMMUTATOR DRESSER CO., Sycamore, Ill. — Industrial Division: J. E. Beggs, Seattle; William J. Cottrell, Portland; Noad & Nicholas, San Francisco; R. W. Burnett, Denver; Raymond Ackerman, Salt Lake City, Utah. Jobber Division; Robinson Sales Co., Seattle; Leonard S. Foley, Portland; Noad & Nicholas, San Francisco; Strieby & Barton, Ltd., Los Angeles.

IDEAL ELECTRIC & MFG. CO., THE, Mansfield, Ohio—F. W. Carlson, Seattle; H. C. Miller, Portland; J. H. Southard, San Francisco; L. J. Smith, Los Angeles; J. A. Coleman, Houston.

ILG ELEC. VENTILATING CO., Chicago, Ill.—J. D. Sparks, Seattle; W. H. Price, San Francisco; G. C. Breidert, Los Angeles; L. E. Belfort, San Diego; J. E. Redmond Co., Phoenix.

ILLINOIS ENGINEERING CO., Chicago, Ill.—W. A. Hill, Seattle; J. W. Luke, Portland; J. L. Krueger, San Francisco; English & Lauer, Inc., Los Angeles; Lee, Pace & Turpin, Salt Lake City.

INDIANA STEEL & WIRE CO., Muncie, Ind.—Graybar Elec. Co., Inc., all principal cities.

INGERSOLL-RAND COMPANY, New York City—Branch Offices: Seattle, San Francisco, Los Angeles, Salt Lake City, Denver, Butte, El Paso, Dallas, Houston.

INLAND GLASS WORKS, INC., Chicago, Ill.—W. K. Turner, Seattle; H. B. Squires Co., San Francisco; Paul A. Douden, Denver.

INTERNATIONAL GENERAL ELECTRIC CO., New York City—Wm. C. North, Div. Mgr., San Francisco.

INTERNATIONAL NICKEL CO., INC., THE, New York City—Household appliances sold through Whitehead Metal Products Co., Inc., Oakland, San Francisco, Los Angeles, Seattle, Portland, Denver, Dallas, Houston.

IRONRITE IRONER CO., THE, Detroit, Mich.—Gordon E. Wilkins, Factory Repr., Oakland; Ironers, Inc., Oakland; Maytag Northwest Co., Portland; Geo. H. Eberhard Co., San Francisco; Watson & Wilson, Inc., Los Angeles; Davis C. Dodge, Inc., Denver; Car Parts Depot, El Paso.

IRVINGTON VARNISH & INSULATOR CO., Irvington, N. J.

ISOLANTITE, INC., New York City—Electrical Specialty Co., Seattle, San Francisco, Los Angeles.

I-T-E CIRCUIT BREAKER CO., Philadelphia, Pa.—Burton R. Stare, Seattle; Oliver B. Lyman, San Francisco; Otto Demmert, Los Angeles; Howard Peterson, Denver.

JANETTE MFG. CO., Chicago, Ill.—Preferred Equipment Eng'rs., Seattle; James P. Hermans, San Francisco; Walter A. Hoppe, Los Angeles; Felix Simon, Denver.

JEFFERSON ELEC. CO., INC., Bellwood, Ill.—John R. Ford, Seattle; C. D. Buchanan, San Francisco; G. E. Martin, Los Angeles.

JEFFERY-DEWITT INSULATOR CO., Kenova, W. Va.—Garland-Affolter Eng'g. Corp., Portland, Seattle, San Francisco, Los Angeles; Tinling & Powell, Spokane; Mountain States Machy. Co., Denver; L. Brandenburger, Salt Lake City.

JEFFRIES TRANSFORMER CO., Los Angeles, Calif. — Dealers, Wholesalers.

JELLIFF MFG. CORP., C. O., Southport, Conn. — Montgomery Bros., Seattle, Portland, San Francisco, Los Angeles.

JENKINS BROS., Bridgeport, Conn. — C. L. Evans, Seattle; I. H. Pope, San Francisco; O. W. Coombs, Los Angeles; W. E. Young Co., Denver

JOHNS-MANVILLE CORP., New York City—Branch Offices: Seattle, Portland, San Francisco, Oakland, Los Angeles, Salt Lake City.

JOSLYN CO. OF CALIFORNIA, Los Angeles, Calif.—Branch Office: San Francisco.

KATO ENGINEERING CO., Mankato, Minn.—Wm. J. Cottrell, Portland; A. Sinai, San Francisco; C. R. Strassner, Los Angeles; C. W. Eggers, Great Falls.

KEARNEY CORP., JAMES R., St. Louis, Mo.—Maydwell & Hartzell, Inc. San Francisco, Los Angeles, Portland; Graybar Elec. Co., Seattle, Spokane, Tacoma, Portland; Mountain States Mchy. Co., Denver; L. Brandenburger, Salt Lake City; Westinghouse Elec. Supply Co., Phoenix.

KELLEMS PRODUCTS, INC., New York City—W. R. Hendrey, Seattle; Geo. E. Honn Co., San Francisco; Farnham & Cunningham, Los Angeles; Franklin Sales Co., Denver.

KELMAN ELEC. & MFG. CO., Los Angeles, Calif.—Eicher & Bratt, Seattle; C. E. Ingalls, San Francisco.

KELVINATOR DIVISION - NASH KELVINATOR CORP., Detroit, Mich.—Harry C. Mealey, Regional Mgr., San Francisco. Sales Offices: San Francisco, Los Angeles.

KENNECOTT WIRE & CABLE CO., Phillipsdale, R. I.—Branch Offices: Seattle, San Francisco, Los Angeles; Maydwell & Hartzell, Inc., San Francisco, Los Angeles, Portland.

KERITE INS. WIRE & CABLE CO., INC., THE, New York City—Branch Office: San Francisco.

KEYSTONE STEEL & WIRE CO., Peoria, Ill.—Maydwell & Hartzell, Inc., San Francisco, Los Angeles, Portland.

KIDDE & COMPANY, INC., WALTER, New York City—Alexander Gow, Inc., Seattle; M. A. Wrenn, Portland; Hough & Egbert, Inc., Industrial Fire Protection Equip. Co., San Francisco; L. N. Curtis & Sons, Oakland; H. P. Jorgensen & Co., Fresno; Ennals T. Ives, Los Angeles; Paul W. Hiller, Wilmington; R. V. Morris & Co., San Diego.

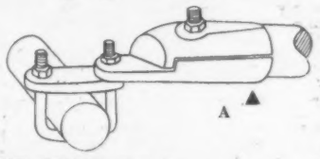
KILLARK ELEC. MFG. CO., St. Louis, Mo.—Northwestern Agencies, Seattle; W. J. Cottrell, Portland; Noad & Nicholas, San Francisco; Henger-Seltzer Co., Los Angeles; W. E. Young Co., Denver; Geo. E. Anderson Co., Dallas.

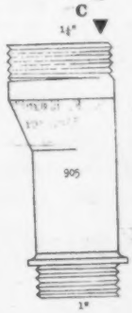
KIM MANUFACTURING CO., Los Angeles, Calif.—Daniel V. Webster, Oakland.

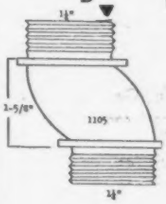
KIRKMAN ENGINEERING CORP., New York City—A. S. Knight Co., Seattle; Electrical Specialty Co., San Francisco, Los Angeles.


## ★ THE HARTMAN LINE ★

***Solves Wiring problems Quickly...***







**A**—GROUND CLAMP that is easy and simple to install. It is threadless and receives rigid or thin wall conduit at any angle. U bolts for this clamp are available in sizes ranging from 1¼" to 6".

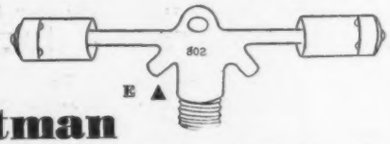
**B**—WEATHER PROOF SOCKETS that are neat in appearance and quickly installed. These long-life sockets are made of aluminum alloy with a highly polished finish. They will hold heavy reflectors at any angle.

**C**—REDUCING ADAPTERS that will simplify many jobs. They are readily adaptable to Westinghouse meter socket. Types 904-5-6 are eccentric types which by turning will line up meter socket with the switch, making a flush mounted job.

**D**—OFFSET NIPPLE* is a time and money saver. It allows mounting of switches, gutter outlet boxes and other equipment where knockouts do not line up.

*Pat. App. for.

**E**—SPREADERS will make the most rigid job for outdoor wiring. For 3-wire circuits ask for No. 803 Hartman spreader.



For information see your jobber or write direct.

**B. Hartman**

708 W. Esther St., Box 708 W. State St., LONG BEACH, CAL.



## Garden Lighting

Kim Manufacturing Co.

423 Molino St., Los Angeles, Calif.

Send for the illustrated catalogue "FAIRY-LAND IS JUST BEYOND YOUR WINDOW-SILL"



## Economical, Dependable Service on TRANSFORMERS

You can inaugurate many plant economies with the efficient and dependable Jeffries Air Cooled Transformers. These transformers simplify plant distribution systems by eliminating the expense of long secondary conduit runs and providing voltage change at the point desired. Jeffries transformers are available to meet all requirements.

*Complete facilities for the manufacture of special oil cooled transformers and repairs on all makes of distribution and power transformers.*

**Jeffries Transformer Company**

5706 Long Beach Avenue Los Angeles

*Dependable Transformers Since 1923*

KISCO CO., St. Louis, Mo.—Smallcomb Elec. Co., Los Angeles.

KLEIN & SONS, MATHIAS, Chicago, Ill.—C. L. Woolsey, Western Mgr., West Los Angeles.

KLIEGL BROS. UNIVERSAL ELEC. STAGE LIGHTING CO., INC., New York City—Branch Offices: San Francisco, Los Angeles.

KNAPP-MONARCH CO., St. Louis, Mo.—L. J. Neary, Branch Mgr., Los Angeles.

KOPP GLASS, INC., Swissvale, Pa.—Jos. Paulson, Portland; Fred Stone, San Francisco; W. E. Welborne, Los Angeles.

KOPPERS CO., (Bartlett Hayward Div.), Baltimore, Md.—F. W. Stevens, Portland; Oliver B. Lyman, San Francisco; Thomas Machinery Co., Los Angeles; Shubart & Schloss, Denver.

KORTICK MFG. CO., San Francisco, Calif.—Maydwell & Hartzell, Inc., Los Angeles; H. H. Manny Co., Seattle; Brown-Johnston Wholesale Co., Spokane.

**LAPP**
INSULATORS
—
**BURNDY**
CONNECTORS
—
Standards of Quality
Foremost in Design
—
**Condon & Young**
INCORPORATED
Telephone: MIchigan 2831
357 So. Hill St. Los Angeles

K. P. F. ELECTRIC CO., San Francisco, Calif.

KUHLMAN ELECTRIC CO., Bay City, Mich.—L. A. Walker Elec. Works, Seattle; William J. Cottrell, Portland; Paul S. Everley, San Francisco.

KWIKON CO., Chicago, Ill.—C. R. Dederick, Portland; Noad & Nicholas, San Francisco; Associated Sales Engineers, Los Angeles; W. E. Young Co., Denver.

LAKE MFG. CO., INC., Oakland, Calif.—Robinson Sales Co., Seattle; William J. Cottrell, Portland; Frank I. DuFrane Co., Inc., San Francisco; Frank J. Airey Co., Los Angeles.

LANDERS, FRARY & CLARK, New Britain, Conn.—C. J. E. Watson, Dist. Mgr., San Francisco; Fred Porter, San Francisco; L. J. McAlister, Alhambra.

LANDIS & GYR, INC., New York City—Geo. L. Hoffman, Portland; Geo. E. Honn Co., San Francisco; Mark Mueller, Denver.

LANG MFG. CO., F. S., Seattle, Wash.

LAPP INSULATOR CO., INC., LeRoy, N. Y.—H. H. Manny and Burton R. Stare, Seattle; Maydwell & Hartzell, Inc., San Francisco; Condon & Young, Los Angeles; Howard Peterson, Denver.

LEACH RELAY CO., Los Angeles, Calif.

LE CARBONE COMPANY, INC., Boonton, N. J.—J. T. Brown, Dist. Eng'r., San Francisco; Burton Stare, Seattle; A. C. Furlong, Portland.

LEEDS & NORTHUP CO., Philadelphia, Pa.—Branch Offices: San Francisco, Los Angeles, Houston, Tulsa.

LIGHTOLIER COMPANY, Jersey City, N. J.—Incandescent Supply Co., San Francisco, Los Angeles.

LINCOLN METER CO., INC., Springfield, Ill.—T. S. Wood, Seattle; L. A. Nott, San Francisco; H. W. Wittenburg, Los Angeles; Mountain States Machy. Co., Denver; L. Brandenburger, Salt Lake City; J. E. Redmond, Phoenix; Frank Gorman, El Paso.

LINDE AIR PRODUCTS CO., THE, Unit of Union Carbide and Carbon Co., New York City—District Offices: Seattle, Spokane, Aberdeen, Portland, San Francisco, Oakland, San Jose, Sacramento, Stockton, Redding, Fresno, Los Angeles, Long Beach, San Diego, Denver, Grand Junction, Pueblo, Boise, Pocatello, Billings, Butte, Great Falls, Dallas, El Paso, Ogden, Salt Lake City, Casper.

LINDEMANN & HOVERSON CO., A. J., Milwaukee, Wis.—P. F. Ross, Dist. Mgr., San Francisco.

LINE MATERIAL CO., So. Milwaukee, Wis.—Branch Offices: Seattle, Portland, Oakland, Tinling & Powell, Inc., Spokane; Utilities Supply Co., Los Angeles; J. A. Johnson, Phoenix.

LIONEL CORP., New York City—M. Sweyd & Son, San Francisco.

LITTLE GIANT, INC., LTD., Oakland, Calif.

LOCKE INSULATOR CORP., Baltimore, Md. — General Electric Supply Corp., All principal cities.

LOCKWOOD MFG. CO., THE, Cincinnati, Ohio—Fred W. Carlson, Seattle; Clarence F. Hunt, San Francisco; Homer V. Thomas, Denver; Arthur C. Moulton, Salt Lake City.

LOCUST PIN CO., Front Royal, Va.—Maydwell & Hartzell, Inc., San Francisco, Los Angeles, Portland.

LOVEJOY FLEXIBLE COUPLING CO., Chicago, Ill.—Jos. E. Paulson, Portland; McCrea Eng'g Supply Co., San Francisco; Associated Sales Engineers, Los Angeles; National Equip. Co., Salt Lake City.

LOVELL MFG. CO., Erie, Pa.—W. L. May Co., Portland; Elec'l Appliance Service Corp., Los Angeles.

LOWELL INSULATED WIRE CO., Lowell, Mass.—Frank D. Fagan Co., San Francisco; Rosse M. Gilson, Los Angeles.

LUMIDOR CO., INC., Alhambra, Calif.

MALLEABLE IRON RANGE CO., Beaver Dam, Wis.—Branch Offices: Seattle, Portland, Oakland.

MANNING, BOWMAN & CO., Meriden, Conn.—Geo. H. Watson, Dist. Mgr., San Francisco; leading wholesalers.

MARTINDALE ELECTRIC CO., THE, Cleveland, Ohio—Marwood Limited, Seattle, Portland, San Francisco, Los Angeles; Hendrie & Bolthoff Mfg. & Supply Co., Denver.

MARTIN & SONS, H. P., Owensboro, Ky.—Branches of General Electric Supply Co., Westinghouse Elec. Supply Co., Graybar Elec. Co.

MARTIN-DECKER CORP., Long Beach, Calif.

MATHIAS-HART CO., Ampere, N. J.—Maydwell & Hartzell, Inc., San Francisco, Los Angeles, Portland.

MATTHEWS CORP., W. N., St. Louis, Mo.—Jobbers Supply Co., Seattle, Portland; Waltham, DeWitt & Krusi, San Francisco; Industrial Eng'r. & Equip. Corp., Los Angeles; R. F. Hamilton, Denver; The Galigher Co., Salt Lake City.

MAYTAG COMYANY, THE, Newton, Ia.—Maytag Northwest Co., Portland; Maytag West Coast Co., Los Angeles; Sparey-Maytag, Inc., Colo. Springs.

McFARLAND CO., L. D., Sandpoint, Idaho—Hendrie & Bolthoff Mfg. & Supply Co., Denver.

McGILL MFG. CO., Valparaiso, Ind.—Frank A. Strohecker, Seattle; George A. Gray Co., San Francisco; J. G. Pomeroy Co., Los Angeles; Fred E. Staible, Inc., Denver.

McGRAW ELECTRIC CO., TOAST-MASTER PRODUCTS DIV., Minneapolis, Minn.—A. J. Cole, Pacific Coast Manager, Los Angeles; O. A. Alderman, Seattle; K. E. Campbell, San Francisco.

MELODY CHIME CO., THE, Los Angeles — Through electrical wholesalers.

MEMCO ENG'G & MFG. CO., Long Island City, N. Y. — Electric Power Specialty Co., Los Angeles.

METAL WARE CORP., THE, Two Rivers, Wis.—John H. Graham Co., San Francisco.

**MAYDWELL & HARTZELL**
INCORPORATED
*Engineers and Manufacturers' Representatives*

★

**ELECTRICAL TRANSMISSION AND DISTRIBUTION LINE MATERIALS**

**TELEPHONE AND TELEGRAPH LINE MATERIALS**

**STEEL PRODUCTS**

158 ELEVENTH ST.
SAN FRANCISCO

455 COLYTON ST.
LOS ANGELES
★
733 N. W. EVERETT ST.
PORTLAND

**W. N. Matthews Corporation**
**St. Louis, Mo.**
**Waltham, DeWitt & Krusi**
San Francisco

**Manufacturers of**
Matthews Fuswitches, Cutouts, Disconnecting Switches, Fuselinks, Solderless Wire Connectors, Guy Guards, and many other pole line construction materials and tools.

**The Galigher Co.** Salt Lake City
**Emmett H. Jones** Los Angeles
**Jobbers Supply Co.,** Seattle, Portland
**R. F. Hamilton** Denver

**Waltham, DeWitt & Krusi**
MANUFACTURERS' REPRESENTATIVES
*Representing*

W. N. Matthews Corp.
Distribution Specialties

Malleable Iron Fittings Co.
Malleable Pole Line Hardware

Anderson Brass Works
Cast electric bronze and aluminum fittings, etc.

United Electric Controls Corp.
Capacitors

Carpenter Mfg. Co.
Portable Flood and Search Lights

Farnham & Cunningham
Line construction equipment

Wolverine Tube Co.
Seamless Copper splicing sleeves, soldering lugs

**630-632 MONADNOCK BLDG., SAN FRANCISCO**

**METER DEVICES COMPANY,** Canton, O.—Fred W. Carlson, Seattle; J. G. Corrin, Los Angeles; R. F. Hamilton, Denver.

**METROPOLITAN DEVICE CORP.,** Brooklyn, N. Y.—James J. Noble Co., San Francisco, for entire Coast; Farnham & Cunningham, Los Angeles, for central station field only.

**MEYERS SAFETY SWITCH CO.,** San Francisco, Calif.

**MICA INSULATOR CO.,** New York City — Electrical Specialty Co., Inc., Seattle, San Francisco, Los Angeles.

**MIDGET HEATER & SPECIALTY CO.,** Tacoma, Wash.—Through wholesalers and dealers.

**MIDWEST ELECTRIC MFG. CO.,** Chicago, Ill.—Keeler, White Co., Seattle, San Francisco, Los Angeles.

**MILLER CO., THE,** Meriden, Conn. —Branch Offices: San Francisco Los Angeles.

**MINNEAPOLIS - HONEYWELL REGULATOR CO.,** Minneapolis, Minn.—Branch Office: San Francisco; Control Equip. Co., Seattle, Portland; Brown Instrument Division, Los Angeles; Wm. A. Flatt Co., Denver; Hawley-Richardson-Williams Co., Salt Lake City; Sullivan Valve & Engr. Co., Butte.

**MOLONEY ELECTRIC COMPANY,** St. Louis, Mo.—Garland-Affolter Engineering Corp., Seattle, Portland, San Francisco, Los Angeles; Love Electric Co., Spokane; R. F. Hamilton, Denver; Salt Lake Hdwe., Salt Lake City.

**MONGERSON'S ELECTRICAL MACHINE WORKS,** Bakersfield, Calif.

**MOORE, EDWARD T.,** Syracuse, N. Y.—Arthur L. Collins, San Francisco.

**MORGANITE BRUSH CO., INC.,** Long Island City, N. Y.—C. M. Coffinberry, Piedmont, Calif.

**MUELLER ELECTRIC CO.,** Cleveland, Ohio—Harry E. Marshall, San Francisco.

**MULLENBACH ELEC'L MFG. CO.,** Los Angeles, Calif.

**NATIONAL CARBON CO., INC.,** CARBON SALES DIV., Cleveland, O.—E. C. Friday, District Mgr., San Francisco.

**NATIONAL ELECTRIC PRODUCTS CORP.,** Pittsburgh, Pa.—Branch Offices: Seattle, Portland, San Francisco, Los Angeles; Bacon-Cooper Co., Denver; Stevens Sales Co., Salt Lake City.

**NATIONAL ENAMELING AND MFG. CO.,** Pittsburgh, Pa.—L. B. French, San Antonio.

**NATIONAL ENAMELING AND STAMPING COMPANY,** Milwaukee, Wis.—Wildon Sales Co., Seattle; T. W. Gulley, San Francisco; Perry B. Miller, Oakland; Arthur J. Beacom Co., Los Angeles; The James H. Blinn Co., Denver; Geo. E. Anderson Co., Dallas.

**NATIONAL MILL & LUMBER CO.,** Oakland, Calif.—Branch office and factory, Los Angeles.

**NATIONAL SPECIALTIES CO., INC.,** Fort Wayne, Ind.—O. W. Coombs Sales Co., Los Angeles.

**NATIONAL VULCANIZED FIBRE CO.,** Wilmington, Del.—F. J. Klenck Co., Inc., Seattle, Portland, San Francisco, Los Angeles.

**NOBLITT-SPARKS INDUSTRIES, INC.,** Columbus, Ind.—E. J. Jordan, Dist. Mgr., Los Angeles; Ballew & Wright, Seattle; Wiggins & Co., Portland; Julius Brunton & Sons Co., San Francisco; Union Hdwe. & Metal Co., Los Angeles.

**NOMA ELECTRIC CORP.,** New York City—Jos. H. Thieben, Geo. R. Simon, San Francisco.

**NORGE DIVISION, BORG WARNER CORP.,** Detroit, Mich.—Geo. Pizarro, Western Sales Mgr., Los Angeles; Leo J. Meyberg Co., San Francisco, Los Angeles. Wholesalers all leading cities.

**NORTH AMERICAN ELECTRIC LAMP CO.,** St. Louis, Mo.—Frank H. Bran Co., San Francisco; Rosse M. Gilson, Los Angeles.

**NORTH BROS. MFG. CO.,** Philadelphia, Pa.—W. B. King, John H. Graham & Co., Inc., San Francisco.

**OHIO BRASS CO.,** Mansfield, O. —Branch Offices: Seattle, San Francisco, Los Angeles, Denver, El Paso, Dallas.

**OHMITE MFG. CO.,** Chicago., Ill. —M. A. Dobbin, Portland; W. I. Otis, L. E. Sperry, San Francisco.

**OKONITE COMPANY, THE,** Passaic, N. J.—I. W. Borda, Pacific Coast Mgr., San Francisco; Branch Offices: Seattle, San Francisco, Los Angeles, Dallas.

**OKONITE-CALLENDER CABLE CO., INC.,** Passaic, N. J.—I. W. Borda, Pacific Coast Mgr., San Francisco. Branch Offices: Seattle, San Francisco, Los Angeles, Dallas.

**OSMOSE CORP. OF AMERICA,** Buffalo, N. Y.—Fred W. Carlson, Seattle; George E. Honn Co., San Francisco.

**OWENS - ILLINOIS GLASS CO.,** Muncie, Ind.—Leading Wholesalers.

**O. Z. ELEC'L. MFG. CO., INC.,** Brooklyn, N. Y.—Geo. A. Gray Co., San Francisco; J. G. Pomeroy Co., Los Angeles.

**PACIFIC ELEC. MFG. CORP.,** San Francisco, Calif.—Branch Offices: Seattle, Los Angeles. Geo. Hamburger Co., Denver; R. Ackerman, Salt Lake City; J. E. Redmond Co., Phoenix; F. W. Gorman, El Paso.

**PACIFIC WIRE ROPE CO.,** Los Angeles, Calif. — Maydwell & Hartzell, Inc., San Francisco, Los Angeles, Portland.

**PALNUT COMPANY, THE,** Irvington, N. J.—W. D. Howze Sales Co., Los Angeles.

**PARAGON ELEC. CO.,** Chicago, Ill.—Eicher & Bratt, Seattle; G. R. Peters, San Francisco; Electric Sales Co., Los Angeles; V. R. Dittman, Denver.

**PARKER ELEC. MFG. CO.,** Oakland, Calif.

**PARTRICK & WILKINS CO.,** Philadelphia, Pa.—Harold M. Hudson, Seattle.

**PAYNE'S BOLT WORKS,** San Francisco, Calif. — Maydwell & Hartzell, Inc., San Francisco.

**PEERLESS ELECTRIC CO., THE,** Warren, Ohio—Montgomery Bros., Seattle, Portland, San Francisco, Los Angeles.

**PELTON WATER WHEEL CO., THE,** San Francisco, Calif.

**PENN ELECTRIC SWITCH CO.,** Goshen, Ind. — Garland - Affolter Eng'g. Corp., Seattle, San Francisco, Los Angeles; Monarch Sales, Denver.

**PERMATEX CO., INC.,** Brooklyn, N. Y.—A. G. Scrivner, Portland; M. D. McMillan, San Francisco; T. L. Camp, Wm. Siburg, Los Angeles.

**PERMUTIT CO., THE,** New York City.—Oliver B. Lyman, San Francisco; U. A. Hammett, Los Angeles.

**PETERS ELECTRIC CO.,** North Hollywood, Calif.

**PHELPS DODGE COPPER PRODUCTS CORP.,** New York City—District Offices: Seattle, San Francisco, Los Angeles, Houston.

**PITT CORPORATION, THE,** Kansas City, Mo.—The Pacific Co., Portland; Clyde L. Chamblin, San Francisco; Paul A. Douden, Denver.

**PITTSBURGH PIPING & EQUIP. CO.,** Pittsburgh, Pa.—Oliver B. Lyman, San Francisco.

**PITTSBURGH REFLECTOR CO.,** Pittsburgh, Pa.—Lyman D. Morgan, Seattle; Hal A. Gardner, San Francisco; Frank E. Hastings, Los Angeles; Raymond Ackerman, Salt Lake City; Paul A. Douden, Denver.

**PORCELAIN INSULATOR CORP., THE,** Lima, N. Y.—Jobbers Supply Co., Seattle, Portland; Joslyn Co. of California, San Francisco, Los Angeles.

**PORCELAIN PRODUCTS, INC.,** Parkersburg, W. Va.—Allied Industries, Inc., Seattle, Portland, San Francisco, Los Angeles; L. Brandenburger, Salt Lake City.

**PORTABLE LIGHT CO., INC., THE,** New York City—Direct to Public Utility Cos.

**PORTER, INC., H. K.,** Everett, Wash.—Gillette & McLaren, Seattle, Portland; Omer Cox Co., San Francisco, Los Angeles.

**POSITIVE LOCK WASHER CO.,** Newark, N. J.—Maydwell & Hartzell, Inc., San Francisco, Los Angeles.

**POTOSI TIE & LUMBER CO.,** Dallas, Tex.—Westinghouse Elec. Supply Co., Los Angeles, Phoenix; Continental Imp. & Exp. Co., El Paso.

**PRATT & WHITNEY DIV. OF NILES - BEMENT - POND CO.,** Hartford, Conn.—E. P. Haquette, San Francisco; D. W. Callen, Los Angeles.

**PROCTOR ELECTRIC CO.,** Philadelphia, Pa. — Harper - Meggee, Inc., Seattle, Spokane, Portland; Irving P. Bean, Seattle; Paul R. Prietsch, Mrs. Kathleen Miller, San Francisco; T. D. Johnston, Mrs. Judith Mitchell, Los Angeles.

**PROVIDENCE INS. WIRE CO.,** Providence, R. I.—Maydwell & Hartzell, Inc., San Francisco., Los Angeles, Portland.

**PURE CARBON CO.,** St. Mary's, Pa.—C. J. Gratiot & Sons, San Francisco.

**QUIMBY PUMP CO.,** Inc., Newark, N. J.—F. J. Hearty Co., San Francisco, Los Angeles.

**RAILLEY CORP.,** Cleveland, O.—Geo. C. Maudslay, Dist Mgr., San Francisco; Paul A. Douden, Denver; General Electric Supply Corp., all principal cities.

**RAILWAY & INDUSTRIAL ENGR. CO.,** Greensburg, Pa. — Chas. Croft, Dist. Mgr., Los Angeles; H. B. Squires Co., Seattle, San Francisco; J. Q. Lalor, Denver; Riter Eng'g Co., Salt Lake City; Electrical-Mechanical Engr. Mats. Co., Phoenix.

**RAY-O-VAC CO.,** Madison, Wis.—Branch Office: San Francisco; Western Distributing Warehouses: San Francisco, Dallas.

**RED SPOT ELEC. CO.,** Tacoma, Wash.—Branch Office: Seattle.

**RELIABLE ELEC. CO.,** Chicago, Ill.—Thomas S. Wood, Seattle; Jobbers Supply Co., Seattle, Portland; Joslyn Co. of Calif., San Francisco, Los Angeles; Graybar Elec. Co., All principal cities.

**RELIANCE AUTOMATIC LTG. CO.,** Racine, Wis.—Harold M. Hudson, Seattle; Reliance Time Switch Service Co., San Francisco; J. J. Perlmuth, Los Angeles.

**RELIANCE ELECTRIC & ENG'G. CO.,** Cleveland, Ohio — H. B. Squires Co., Seattle, San Francisco, Los Angeles.

**REPUBLIC STEEL CORP.,** Cleveland, O.—Branch Offices: Seattle, San Francisco, Los Angeles, Denver, Salt Lake City.

**RHODES, INC., M. H.,** Hartford, Conn.—Kitchen & Evans, Seattle; James P. Hermans, San Francisco; Wm. J. Goebel, Los Angeles.

**RITTENHOUSE CO., INC., A. E.,** Honeoye Falls, N. Y.—Northwestern Agencies, Seattle; Northwest Sales Co., Portland; Jas. J. Noble Co., San Francisco; Rosse M. Gilson, Los Angeles.

**ROBBINS & MYERS, INC.,** Springfield, O.—C. R. Hunt, San Francisco.

**ROBERTS MFG. CO.,** San Francisco, Calif.

**ROCKBESTOS PRODUCTS CORP.,** New Haven, Conn.—Marwood Limited, Seattle, Portland, San Francisco, Los Angeles.

**ROCKWOOD MFG. CO.,** Indianapolis, Ind.—L. B. Warner, West Coast Eng'r., Glendale; Munnell & Sherrill, Portland; W. C. Hendrie & Co., Los Angeles; Hendrie & Bolthoff Mfg. & Sup. Co., Denver; McConkey-Docker & Co., Phoenix; Texas Belting Co., Inc., Houston.

**RODALE MFG. CO.,** Emaus, Pa.—Jos. Liner, Dist. Mgr., Los Angeles; West Coast Warehouse: Los Angeles.

**ROEBLING'S SONS CO. OF CALIFORNIA, JOHN A.,** San Francisco, Calif.—Sales Offices: Seattle, Portland, Los Angeles.

**ROGERS PAPER MFG. CO.,** Manchester, Conn.—Marwood Limited, Seattle, Portland, San Francisco, Los Angeles.

**ROLLER-SMITH CO.,** New York City—J. C. McDougall, Seattle; Electric Material Co., San Francisco, Los Angeles; Mark Mueller, Denver; C. F. Cate, El Paso.


MOLONEY

**TRANSFORMERS**

- Power
- Distribution
- Constant Current
- Subway
- Network
- Air-Cooled

**MOLONEY ELECTRIC**
COMPANY
**SAINT LOUIS**

Distributed by

Garland-Affolter Eng. Corp.
Los Angeles - Portland
San Francisco - Seattle

• • •

Salt Lake Hardware Company
Salt Lake City, Utah

• • •

Love Electric Company
Tacoma, Washington

• • •

Nixon-Kimmel Company
Spokane, Washington

• • •

R. F. Hamilton
Gas & Elec. Bldg., Denver

**MEYERS**
Enclosed Safety Switches
Switchboards—Panelboards
Electrical Sheetmetal Products
Meyers Safety Switch Co., Inc.
423 Tehama St., San Francisco

**SAFETY SWITCHES**
*MONGERSON'S*
Panelboards for Pumping Plants
Wiring Gutter
Electrical Sheet Metal Products
MONGERSON'S ELECTRICAL MACHINE WORKS
220-230 E. 19th St., Bakersfield, Calif.

***California and Arizona Representative***
**Roller-Smith Co.**—Regulators, Electrical Measuring Instruments, Air and Oil Circuit Breakers, Switchboards.
**American Lava Corporation**—Lava and Alsimag Ceramic Insulating and High Heat Resisting Materials for Electrical Equipment.
**THE ELECTRIC MATERIAL CO., Inc.**
912 E. Third Street, Los Angeles, Calif. MU 9076
163 Second Street, San Francisco, Calif., DO 3007

# MARWOOD
Limited

*Manufacturers' Representatives and Distributors*

ANACONDA WIRE & CABLE CO.
Magnet Wire
Extra Flexible Wire & Cable

ANCHOR WEBBING CO.
Cotton Tape,
Webbing & Sleeving

ARCO CO., OF CALIFORNIA
Insulating Varnishes

ASHEVILLE MICA CO.
Mica Products

BROWNING MFG. CO.
Paper Motor Pulleys
Vee Drives

CONTINENTAL-DIAMOND FIBRE CO.
Celoron-Dilecto-Fibre
Micabond-Vulcoid

FOSTORIA PRESSED STEEL CORP.
Flexible Localites

WILBUR B. DRIVER CO.
Resistance
Wire

ROCKBESTOS PRODUCTS CORP.
Asbestos Insulated
Wire and Cable

ROGERS PAPER MFG. CO.
Duro-Kaygrey-Royal Grey
Insulating Papers

TRICO FUSE MFG. CO.
Kantark and Trico Powder Packed
Fuses, Colortop Plugs, Kliploks

UNITED STATES GRAPHITE CO.
Motor and Generator Brushes
Brush Plates-Welding Rods

WESTINGHOUSE ELECTRIC & MFG. CO.
Insulating Cloths, Tapes and Varnishes

Complete Insulating Material Service
Parts for all makes of Motors and Generators

MARWOOD
ELECTRICAL SPECIALTIES

• SAN FRANCISCO
• PORTLAND
• LOS ANGELES
• SEATTLE



# Sterling Reflectors

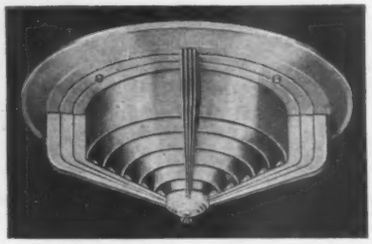
of Silvered Glass for every requirement of show window lighting, display cases, refrigerators, cove lighting, etc.

## Sterling Lite-Flo Reflectors

Show window lighting reflectors incorporating the **Sterling** Lite-Flo Stipple and other design improvements. Projects light with highest efficiency, giving intense illumination of window displays with surprisingly low wattage. Catalog on request.

## STER-LITE FIXTURES by Sterling

The last word in store illuminating efficiency. Projects intense light direct to merchandise with diffused general illumination for eye comfort. Extensively used by leading merchandisers. Bulletin 8000 gives details and installation pictures.



REPRESENTATIVES:

H. B. Squires Co. 1277 Howard St., San Francisco
1316 E. Olympic Blvd., Los Angeles 305 First Ave., S., Seattle
Stevens Sales Co. 32 S. W. Temple St., Salt Lake City
Walter W. Martin 1646 Araphoe St., Denver


RUSSELL & STOLL COMPANY, New York City—Fred W. Carlson, Seattle; H. B. Squires Co., San Francisco; Zinsmeyer, Inc., Los Angeles; Alex Hibbard Co., Denver.

RUSSELL, BURDSALL & WARD BOLT AND NUT CO., Port Chester, N. Y.—Maydwell & Hartzell, Inc., San Francisco, Los Angeles.

RUSSELL ELEC. CO., Chicago, Ill.—Montgomery Bros., Seattle, Portland, San Francisco, Los Angeles; Kelly-How-Thomson Co., Billings.

RUTENBER ELEC. CO., Marion, Ind.—Associated Wholesale Elec. Co., Los Angeles; General Sales Corp., San Francisco.

SAFETY LIVE LINE TOOL CO., Oakland, Calif.

ST. LOUIS MALLEABLE CASTING CO., St. Louis, Mo.—Maydwell & Hartzell, Inc., San Francisco, Los Angeles.

SAMSON-UNITED CORP., Rochester, N. Y.—Bailey Dinkelspiel, San Francisco; G. Heflin, Denver.

S & M LAMP CO., Los Angeles, Calif.—Lester Baxter, Portland; George Curtiss, San Francisco; California-Arizona Sales Agency, San Diego; W. E. Young, Denver.

SANGAMO ELECTRIC CO., Springfield, Ill.—T. S. Wood, Seattle; L. A. Nott, San Francisco; H. W. Wittenburg, Los Angeles; Mountain States Machy. Co., Denver; L. Brandenburger, Salt Lake City; J. E. Redmond, Phoenix; Frank Gorman, El Paso.

SAUEREISEN CEMENTS CO., Sharpsburg, Pa. — Montgomery Bros., Seattle, Portland, San Francisco, Los Angeles.

SAVAGE ARMS CORP., Utica, N. Y.—Savage Distributing Co., San Francisco.

SCHWARZE ELECTRIC CO., Adrian, Mich.—Allied Industries, Inc., Seattle, San Francisco, Los Angeles.

SCHWEITZER & CONRAD, INC., Chicago, Ill.—T. S. Wood, Seattle; Geo. E. Honn Co., San Francisco: Farnham & Cunningham, Los Angeles; Riter Eng'g Co., Salt Lake City.

SELECTRON CO., INC., Los Angeles, Calif.

SENTRY CO., THE, Foxboro, Mass.—E. A. Wilcox Co., San Francisco.

SESSIONS CLOCK CO., THE, Chicago, Ill.—Branch Office: San Francisco.

SHERMAN MFG. CO., H. B., Battle Creek, Mich.—Detsch & Co., Seattle, Spokane, Portland, San Francisco, Fresno, Los Angeles, Denver, Salt Lake City.

SIGNAL ENGINEERING & MFG. CO., New York City — Pacific Elec'l Distributors, Seattle.

SILEX COMPANY, Hartford, Conn.—Jack Winkler, Seattle; A. L. Anderson, San Francisco; Wilbur D. Curtis, Los Angeles; James H. Blinn Co., Denver; Martin Brauman, Dallas.

SIMPLEX WIRE & CABLE CO., Cambridge, Mass.—Branch Offices: Seattle, San Francisco, Los Angeles.

S. MORGAN SMITH CO., York, Pa.—Gordon & Finkbeiner, Portland; Fred H. Bostwick, Denver; E. G. Dewald, Salt Lake City.

SMITH & SON, INC., SEYMOUR, Oakville, Conn.—John H. Graham & Co., Inc., San Francisco; Graybar Elec. Co., American Automatic Elec. Sales Co., Kellogg Switchboard & Supply Co., all branches. Leading hdwe. jobbers.

SMOOT-HOLMAN COMPANY, Inglewood, Calif.—L. A. Hobbs, Mgr., San Francisco branch office; Coast Sales Corp., Seattle; Lester M. Baxter, Portland.

SOLA ELECTRIC CO., Chicago, Ill.—Frank D. Fagan Co., San Francisco; Marsh Sales Agency, Los Angeles; Central Electric Co., Denver; Radio Supply Co., Salt Lake City.

SPERO ELECTRIC CORP., THE, Cleveland, Ohio—O. W. Coombs, Los Angeles; Fred E. Staible, Denver; C. J. Elder, Salt Lake City.

SQUARE D COMPANY, Milwaukee, Wis., Detroit, Mich., Los Angeles, Calif.—District Offices: San Francisco, Denver.

STANDARD ELECTRIC MFG. CORP., Toledo, O.—Wm. P. Swartz, Pacific Coast Dist. Mgr., Los Angeles, Wholesalers.

STANDARD HOUSE FURNISHINGS CORP., Cleveland, Ohio—Frank D. Fagan Co., San Francisco, Los Angeles.

STATES CO., THE, Hartford, Conn.—G. L. Hoffman, Portland; C. E. Ingalls, San Francisco; A. A. Barbera, Los Angeles; Mountain States Machy. Co., Denver; L. Brandenburger, Salt Lake City.

STEEL AND TUBES, INC., Cleveland, O.—Branch Offices: Seattle, San Francisco, Los Angeles, Salt Lake City.

STEEL CO., HERMAN D., Philadelphia, Pa.—Geo. L. Hoffman, Portland; A. F. Bleckamith, Los Angeles; Paul Douden Co., Denver; H. E. Holland, Salt Lake City; Len Powell, Dallas; C. B. Anderson Co., Tulsa, Oklahoma City.


Meters, Time Switches, Sign Flashers, Test Blocks, Test Switches
SANGAMO - LINCOLN
SUPERIOR - HD ELECTRIC CO.
L.A. NOTT 1061 Howard Street San Francisco Central-Northern Cal.
HEmlock 4738 Nevada, Oregon

■ TOM WOOD ■
TRANSFORMERS
INSULATORS
CONNECTORS
SWITCHES
METERS
220 9th Ave., North, *Seattle*

# "RED CAP"
## FLOOD-LITES & REFLECTORS

"BETTER LITE-ING"
FOR
SATISFACTION

"SINCE 1909"

Order From Your Independent Electrical Wholesaler
S & M LAMP CO.
119 West Thirty-Sixth Place Los Angeles, California

STEIGER & KERR STOVE & FOUNDRY CO., San Francisco, Calif.—Frank D. Barrett, Portland; Graham Hambly Sons, Los Angeles.

STERLING ELECTRIC MOTORS, INC., Los Angeles, Calif.—H. S. Emanuels, Seattle; L. F. Newton, Portland; Geo. A. Hindley, San Francisco; R. F. Hamilton, Denver; Industrial Supply Co., Salt Lake City; J. E. Redmond Co., Phoenix.

STERLING REFLECTOR CO., Chicago, Ill.—H. B. Squires Co., Seattle, San Francisco, Los Angeles; Walter W. Martin, Denver; Stevens Sales Co., Salt Lake City.

STEWART-WARNER CORP., Chicago, Ill.—Domestic Utilities, Inc., Seattle; Moore Electric Supply Co., San Francisco, Los Angeles.

STICHT & COMPANY, HERMAN, New York City—Geo. L. Hoffman, Portland; T. R. Routh Co., San Francisco; L. W. Thompson, Los Angeles; Paul A. Douden, Denver.

STRUTHERS DUNN, INC., Philadelphia, Pa.—Robinson Sales Co., Seattle, Portland; C. E. Ingalls, San Francisco; L. W. Thompson, Los Angeles; Peterson Co., Denver; J. Y. Schoonmaker, Dallas.

STURTEVANT CO., THE B. F., Berkeley, Calif.—Branch Offices: Seattle, Portland, San Francisco, Los Angeles; A. A. Maycock Co., Salt Lake City.

SUN-GLO LAMP WORKS, INC., Brooklyn, N. Y.—G. M. Lowman & Associates, Seattle; Consolidated Sales Co., San Francisco, Los Angeles; Stone-Hall Co., Denver.

SUPERIOR ELEC. PRODUCTS CORP., St. Louis, Mo.—M. Seller Co., Portland, San Francisco, Los Angeles.

SUPERIOR INSULATING TAPE CO., St. Louis, Mo. — Keeler, White Co., Seattle, San Francisco, Los Angeles.

SUPERIOR PORCELAIN CO., Parkersburg, W. Va. — Albert S. Knight Co., Seattle; Thos. D. Noble Co., San Francisco; Walter S. Sweet Co., Los Angeles.

SUPERIOR SWITCHBOARD & DEVICES CO., THE, Canton, O. —T. S. Wood, Seattle; L. A. Nott, San Francisco; E. H. Bell, Los Angeles.

SWARTZ & WHITE MFG. CO., Binghamton, N. Y.—W. J. McRae, Branch Mgr., San Francisco; W. Montelius Price Co., Seattle; A. J. Glesener Co., San Francisco; Machinists Tool & Supply and Zonne Elec. Tool Co., Los Angeles; H. M. Cree Co., Dallas.

SWARTZBAUGH MFG. CO., Toledo, O.—D. E. Sanford Co., Seattle, San Francisco, Los Angeles.

SYNTRON CO., Homer City, Pa.—F. W. R. Preer, Portland; P. H. Nelson, San Francisco; Sutor & Co., M. N. Thackaberry, Chemical Equip. Corp., Los Angeles.

TAPER TUBE POLE CO., San Francisco, Calif.—Neil E. Brown, San Diego.

TAPLET MFG. CO., Philadelphia, Pa.—Keeler, White Co., Seattle, San Francisco, Los Angeles.

TAYLOR INSTRUMENT COMPANIES, Rochester, N. Y.—Branch Offices: San Francisco, Los Angeles. L. H. Wear, Portland; D. J. McQuaid, Denver.

TECK-LITE MFG. CO., Los Angeles, Calif.

TEMPLETON, KENLY & CO., Chicago, Ill.—Branch Offices: Seattle, San Francisco. Graybar Electric Co., Seattle, San Francisco, Los Angeles.

THERMADOR ELEC'L. MFG. CO., Los Angeles, Calif.—W. H. Gribble, Dist. Mgr., Oakland; Robt. O. Webster, Sacramento; Frank Collins, Portland. All Leading Wholesalers.

THOMAS & BETTS CO., THE, Elizabeth, N. J.—F. A. Stroheckker, Seattle; E. L. Johnson, San Francisco; E. J. Frentress, Los Angeles; James H. Blinn Co., Denver.

THOMAS & SONS CO., THE R., Lisbon, Ohio — Graybar Electric Co., all principal cities.

TOBE DEUTSCHMAN, INC., Canton, Mass.—Merton A. Dobbin, Portland; James P. Hermans, San Francisco; James C. Pope, Los Angeles.

TOLEDO STANDARD COMMUTATOR CO., Toledo, O.—Electric Agencies, Oakland; E. H. Bell, Los Angeles; Fairman B. Lee, Seattle.

TORK CLOCK CO., INC., Mount Vernon, N. Y.—H. M. Sayers, Seattle; H. E. Sandoval, San Francisco; A. R. Slimmon, Los Angeles.

TRADE WIND MOTORFANS, INC., Los Angeles, Calif.

TRIANGLE CONDUIT & CABLE CO., INC., Elmhurst, New York City, N. Y.—C. C. Hillis, Vice President in charge of Western Territory, San Francisco; W. M. Sanderlin, Seattle; Sines & Boardman, Los Angeles.

TRICO FUSE MFG. CO., Milwaukee, Wis.—M. L. Woodard, San Francisco; W. E. Young Co., Denver.

TRIPLETT ELEC'L INSTRUMENT CO., THE, Bluffton, Ohio—J. J. Backer, Seattle; Howard M. Saul, Los Angeles.

TRUMBULL ELEC. MFG. CO., Plainville, Conn.—Branch Offices: Seattle, San Francisco, Los Angeles.

TRUMBULL ELEC. MFG. CO., INC., San Francisco, Calif.—Offices and Factories: Seattle, Los Angeles.

UNION METAL MFG. CO., THE, Canton, O.—R. G. VandenBoom, West Coast Manager, Hollywood; E. Zimmerman, Sales Engineer, San Francisco; Taper Tube Pole Co., San Francisco; Line Material Co., all offices; Mt. States Machy. Co., Denver. Leading wholesalers.

UNITED STATES ELEC. MFG. CORP., New York City—A. M. Lanyon, Branch Mgr., San Francisco.

U. S. ELEC'L. MOTORS, INC., Los Angeles, Calif. — Industrial Elec. Co., Seattle; Nixon-Kimmel Co., Spokane; Ray I. Smythe, Portland; California Elec. Works, Ltd., San Diego; Elec. Equip. & Engr. Co., Denver; Mine & Smelter Supply Co., Salt Lake City; L. Vernon Wilson, Phoenix; Industrial Equip. Co., Albuquerque.

UNITED STATES GRAPHITE CO., Saginaw, Mich.—Marwood Limited, Seattle, San Francisco, Los Angeles.

UNITED STATES RUBBER PRODUCTS, INC., New York City—F. D. Benz, Mgr. Wire Sales. Pacific Division, San Francisco; Branch Offices: Seattle, Spokane, Portland, San Francisco, Los Angeles, Salt Lake City.

UNITED STATES STEEL CORP., New York City—Columbia Steel Co., San Francisco.

UNIVERSAL BLOWER CO., Birmingham, Mich.—M. E. Hammond, San Francisco.

UNIVERSAL COOLER CORP., Detroit, Mich.—Dwight E. Morris, Portland; J. L. Burton, Los Angeles.

UNIVERSAL WINDING CO., Boston, Mass.—E. G. Paules, Los Angeles.

UPTEGRAFF MFG. CO., R. E., Pittsburgh, Pa.—Burton R. Stare, Seattle; Oliver B. Lyman, San Francisco; The Demmert Co., Los Angeles; E. H. Jacobs, Dallas.

UTILITIES SERVICE CO., Allentown, Pa.—Industrial Eng'g & Equip. Corp., Los Angeles.

UTILITY ELEC. CO., St. Louis, Mo.—Harry A. Meier, Seattle; Portland; Fred C. Wood, San Francisco; Arthur Koll, Los Angeles.

UTILITY FAN & MFG. CO., Los Angeles, Calif.—Albert K. Weller, Portland.

UTILITY ILLUMINATING CO., Oakland, Calif.—Lester Baxter, Portland; Jim Edwards, Vancouver.

VALLEY MFG. CO., Woodburn, Ore.—Jobbers Supply Co., Seattle, Portland; Maydwell & Hartzell, Inc., San Francisco.

VULCAN ELECTRIC CO., Div. of Consolidated Elec. Lamp Co., Lynn, Mass.—Garnett Young & Co., Seattle, San Francisco, Los Angeles; Bacon-Cooper Co., Denver; O. T. Jenkins Co., Dallas.

WABASH APPLIANCE CORP., Brooklyn, N. Y.—G. M. Lowman & Associates, Seattle; Consolidated Sales Co., San Francisco, Los Angeles; Stone-Hall Co., Denver.

WADSWORTH ELEC. MFG. CO., INC., THE, Covington, Ky.—Keeler, White Co., Seattle, San Francisco, Los Angeles.


**H. B. SQUIRES CO.**

San Francisco — Seattle — Los Angeles
Representing National Manufacturers of
LIGHTING EQUIPMENT, APPARATUS and SUPPLIES
*Quality Equipment for Every Electrical Requirement*

EDWIN L. WIEGAND CO. — Chromalox Electric Heating Elements
AINSWORTH LIGHTING, INC. — Lighting Fixtures, Domestic & Commercial
PEERLESS ELECTRIC CO. — Exhaust Fans, Blower Units & Panels, Furnace Fans
JOHN WOOD MFG. CO. — Thermo-Watt—Storage & Quick Recovery Electric Water Heaters
C. O. JELLIFF MFG. CO. — Resistance Wire
SAUEREISEN CEMENTS CO. — Electric Resistor Cements

*Exclusively Represented in the Following Territory:*
Washington, Oregon, Utah, Nevada, Arizona and California
by
★ **Montgomery Brothers**
SEATTLE 911 Western Ave. — SAN FRANCISCO 61 Fremont St. — LOS ANGELES 912 E. Third St. — PORTLAND 1501 N. W. Kearney

**▲WESTERN**
*Air Cooled* **TRANSFORMERS ARE DEPENDABLE**

Reduce installation costs and improve service by specifying Western Air Cooled Transformers.... They are long lasting and of highest quality. . . . They are made by a Western firm established and continuously in operation since 1909. . . . For greater profits, dealers are invited to make us your transformer headquarters. . . . Write today for price sheets.

**Western Transformer Co.**
618 EAST ELEVENTH ST.
OAKLAND, CALIF.

**TORK CLOCKS**
New Models - New Bulletins - New Prices
*Ask Our Nearest Representative*
H. M. Sayers, 1019 Eastlake Ave., Seattle, Wash.
H. E. Sandoval, 1016 Howard St., San Francisco, Calif.
A. R. Slimmon, 445 E. 3d St., Los Angeles, Calif.
TORK CLOCK CO., Inc., Mount Vernon, N.Y.

WAGNER ELEC. CORP., St. Louis, Mo.—Branch Offices: Seattle, Portland, San Francisco, Los Angeles, Denver, Salt Lake City.

WAKEFIELD BRASS CO., THE F. W., Vermilion, Ohio—H. B. Squires Co., Seattle, San Francisco; F. J. Airey Co., Inc., Los Angeles.

WALKER BROTHERS, New York City—Garnett Young & Co., Seattle, San Francisco, Los Angeles.

WALKER & PRATT MFG. CO., Boston, Mass.—Fred Conkey, West Coast Sales Mgr., Los Angeles; Home Elec. Co., Tacoma; Hughes & Co., Spokane; Graybar Elec. Co., Inc., San Francisco; Fey & Krause, Inc., Los Angeles; C. C. Anderson Co., Boise.

WARD LEONARD ELEC. CO., Mount Vernon, N. Y.—Northwestern Agencies, Seattle; Electrical Material Co., San Francisco; A. R. Slimmon & Co., Los Angeles; Raymond Ackerman, Salt Lake City; Mark G. Mueller, Denver; John S. Clark, El Paso.

WARREN TELECHRON CO., Ashland, Mass.—Guy Cooper, Branch Mgr., Los Angeles; Leading Wholesalers.

WASHING MACHINE PARTS CO., Los Angeles, Calif.

WATLOW ELECTRIC MFG. CO., St. Louis, Mo.—Elec'l. Manufacturers' Supply Co., Los Angeles.

ADEQUATE WIRING EQUIPMENT

☆

F. J. Airey Co.
Inc.
1855 Industrial St., Los Angeles
MI 7981

WEBSTER ELECTRIC CO., Racine, Wis. — Garland-Affolter Eng'g Corp., Seattle, San Francisco, Los Angeles.

WELCOME METER CO., Los Angeles, Calif.

WELLS MANUFACTURING CO., San Francisco, Calif.—J. D. Sparks, Seattle.

WESIX ELEC. HEATER CO., San Francisco, Calif.—Branch Offices: Seattle, Portland, Los Angeles.

WEST WIND CORP., Seattle, Wash.—D. R. Munro & Son, Portland; Frederick & Starky, Spokane; W. F. O'Keefe, Jr., San Francisco; Harmony Mfg. Co., Los Angeles; The United Materials, Inc., Denver; Charles Livingston, Salt Lake City.

WESTERN ELECTRO-MECHANICAL CO., INC., Oakland, Calif.—Geo. L. Hoffman, Portland; Farnham & Cunningham, Los Angeles.

WESTERN ENGINE CORP., Los Angeles, Calif.

WESTERN TRANSFORMER CO., Oakland, Calif.

WESTINGHOUSE ELEC. & MFG. CO., E. Pittsburgh, Pa.—W. R. Marshall, Vice President, San Francisco, Branch Offices; Seattle, Portland, San Francisco, Los Angeles, Salt Lake City, Phoenix, Butte.

WESTINGHOUSE ELEC. ELEVATOR CO., Jersey City, N. J.—Branch Offices: San Francisco, Los Angeles.

WESTINGHOUSE ELEC. SUPPLY CO., San Francisco, Calif.—R. J. Holtermann, Vice President & Dist. Mgr., San Francisco. Branch Offices: Seattle, Spokane, Portland, San Francisco, Oakland, Sacramento, Los Angeles, Salt Lake City, Phoenix, Butte.

WESTINGHOUSE LAMP CO., New York City—R. W. Murphy, Pacific Coast Mgr., San Francisco. Branch Offices: Seattle, San Francisco, Los Angeles.

WESTINGHOUSE X-RAY CO., Long Island City, N. Y.—Branch Offices: San Francisco, Los Angeles.

WESTON ELEC'L. INSTRUMENT CORP., Newark, N. J.—Eicher & Bratt, Seattle; Herman E. Held, San Francisco; A. A. Barbera, Los Angeles; J. W. Van De Grift, Denver; J. E. Redmond Co., Phoenix.

WUELKER BABY WHITE KITTEN LIGHTING UNITS

Flexo-Domes . . . Wuelkerites . . . Adjus-To-Angles
Floodlighting Interiors & Exteriors . Theatrical Lighting
Show Window Lighting . . . General Illumination
LIGHTING UNITS MADE TO ORDER

WUELKER LIGHTING CO.
889 PACIFIC AVENUE SAN FRANCISCO, CALIF.

WEYERHAEUSER POLE CO., Lewiston, Idaho—Distributed by General Elec. Supply Corp., Westinghouse Elec. Supply Co.

WHEELER REFLECTOR CO., Boston, Mass.—H. B. Squires Co., Seattle, San Francisco, Los Angeles; H. E. Holland, Salt Lake City.

WHITEHEAD METAL PRODUCTS CO., INC., New York City—J. J. Whitehead, Jr., Dist. Mgr., Oakland. District Offices: Seattle, Portland, San Francisco, Los Angeles, Denver, Dallas, Houston.

WIEGAND CO., EDWIN L., Pittsburgh, Pa.—Montgomery Brothers, Seattle, Portland, San Francisco, Los Angeles; The Peterson Co., Denver.

WILMINGTON FIBRE SPECIALTY CO., Wilmington, Del.—District Offices: Seattle, San Francisco, Los Angeles, Denver, Salt Lake City.

WILSON LIGHTING, INC., Chicago, Ill.—Leading Wholesalers.

WIREMOLD COMPANY, THE, Hartford, Conn.—F. A. Strohecker, Seattle; Geo. A. Gray, San Francisco; F. J. Airey Co., Los Angeles.

WOLFF ELECTRIC WORKS, INC., Portland, Ore.

WOLVERINE TUBE CO., Detroit, Mich.—Albert S. Knight Co., Seattle; Waltham, DeWitt & Krusi, San Francisco; J. T. Hill Sales Co., Los Angeles; Monarch Sales Co., Denver.

WOOD MFG. CO., JOHN, Conshohocken, Pa.—Montgomery Bros., Seattle, Portland, San Francisco, Los Angeles.

WOODWARD GOVERNOR CO., Rockford, Ill.—All prime mover mfrs.

WOOLWINE-NORRIS CORP., Los Angeles, Calif.—Edw. W. Ogden, Berkeley; J. H. Fisher, Tulare.

WORTHINGTON PUMP & MACHINERY CORP., Harrison, N. J.—Branch Offices: Seattle, Portland, San Francisco, Los Angeles, Denver, El Paso.

WUELKER LIGHTING CO., San Francisco, Calif.

YORK ICE MACHINERY CORP., York, Pa.—Sales and Service Branches: Seattle, Spokane, Portland, San Francisco, Sacramento, Fresno, Los Angeles, Denver, Salt Lake City, Pocatello, Houston, Dallas, Phoenix.

YOUNGSTOWN SHEET & TUBE CO., THE, Youngstown, O.—Allied Industries, Inc., Seattle, Portland, San Francisco, Los Angeles.

ZENITH RADIO CORP., Chicago, Ill.—Factory Repr. L. W. Sturdevant, Menlo Park, Calif. Distributors: Seattle Hdw. Co., Seattle; Elec'l. Distr. Co., Portland; H. R. Basford Co., San Francisco; Electric Equip., Los Angeles; Jas. S. Remick Co., Sacramento.

## INDEX TO MANUFACTURERS' DIRECTORY

April, 1938

Airey Co., F. J. ..... 90
American Transformer Co.. 81
Apex Rotarex Mfg. Co.... 81

Benjamin Elec. Mfg. Co... 81
Bowie Switch Co. ..... 81

Clements Mfg. Co..... 82
Condon & Young, Inc..... 86
Cramer & Co., Inc., R. W. 82

Dolph Co., John C..... 83

Electric Heater Co., The.. 83
Electric Material Co., Inc., 87

Fireproof Wall Co..... 83

Gardner Elec. Mfg. Co.... 84

Hartman, B. ..... 85
Honn Co., Geo. E..... 82
Hubbard & Company..... 84

Ingalls, C. E..... 83

Jeffries Transformer Co.... 85

Keese Engineering Co..... 84
Kim Mfg. Company..... 85

Marwood Limited ..... 88
Matthews Corp., W. N.... 86
Maydwell & Hartzell, Inc... 86
Meyers Safety Switch Co.. 87
Moloney Electric Co..... 87
Mongerson's Elec'l Machine Works ..... 87
Montgomery Bros. ..... 89

Nott, L. A..... 88

S & M Lamp Co..... 88
Squires Co., H. B..... 89
Sterling Reflector Co..... 88

Thompson, L. W..... 83
Tork Clock Co., Inc..... 89

Waltham, DeWitt & Krusi. 86
Western Transformer Co... 89
Wood, T. S. ..... 88
Wuelker Lighting Co..... 90

# WHERE TO BUY IN THE WEST

**Air Conditioning**
Frigidaire Corp.
General Elec. Co.
Graybar Elec. Co., Inc.
Kelvinator Corp.
Norge Division, Borg-Warner Corp.

**Ammeters and Voltmeters**
Ferranti Elec., Inc.
General Elec. Co.
Roller-Smith Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec. Instr. Corp.

**Anchors, Guy**
A. B. Chance Co.
Everstick Anchor Co.
Hubbard & Co.
James R. Kearney Corp.
W. N. Matthews Corp.

**Anchor and Guy Rods**
A. B. Chance Co.
General Elec. Co.
Hubbard & Co.
Maydwell & Hartzell, Inc.

**Appliances, Household**
Apex-Rotarex Mfg. Co.
Chicago Flexible Shaft Co.
Clements Mfg. Co.
Easy Washing Machine Corp.
Edison General Elec. Appliance Co., Inc.
Frigidaire Division
General Elec. Co.
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Kelvinator Division
Landers, Frary & Clark
Leonard Division
Malleable Iron Range Co.
National Enameling & Stamping Co.
Noblitt-Sparks Industries, Inc.
Norge Division
Standard Elec. Mfg. Corp.
The Silex Co.
Thermador Elec'l Mfg. Co.
Utility Electric Co.
Wesix Elec. Heater Co.
Westinghouse Elec. Supply Co.
The Woolwine-Norris Corp.

**Boxes**
General Cable Corp.
General Elec. Co.
Superior Switchboard & Devices Co.

**Brackets, Wood**
Locust Pin Co.

**Breakers**
**Air Circuit Breakers**
Electric Material Co.
General Elec. Co.
I-T-E Circuit Breaker Co.
Roller-Smith Co.
Sangamo Elec. Co.
Westinghouse Elec. & Mfg. Co.

## *Matthews Scrulix Anchors*

● The original Screw Type Anchor. For anchoring pole lines or anything that requires anchorage in earth. They are screwed into solid ground. No holes to dig, nothing to assemble.

**Made in Three Styles:**

A. 10 Catalog Numbers, 6-inch to 10-inch sizes for installation with Wrench.

B. 6 Catalog Numbers, 6-inch to 12-inch sizes for installation without Wrench.

C. 2 Catalog Numbers, 10-inch to 12-inch sizes for pipe rod installation in swamps and marshy ground.

Complete information about Matthews Scrulix Anchors in an interesting bulletin supplied on request.

## W. N. MATTHEWS CORPORATION

**ST. LOUIS, MO.**

**Oil Circuit Breakers**
Allis-Chalmers Mfg. Co.
Electric Material Co.
General Elec. Co.
Pacific Elec. Mfg. Corp.
Roller-Smith Co.
Westinghouse Elec. & Mfg. Co.
Line Material Co.

Pacific Elec. Mfg. Corp.

**Bus Fittings**
Burndy Eng'g Co.
General Elec. Co.

**Buses**
Aluminum Co. of America

**Bushings**
General Elec. Co.
Lapp Insulator Co., Inc.
Locke Insulator Corp.
Ohio Brass Company
Westinghouse Elec. & Mfg. Co.

**Cable Accessories**
General Cable Corp.
General Elec. Co.
James R. Kearney Corp.
John A. Roebling's Sons Co.

**Cables**
Aluminum Co. of America
American Steel & Wire Co.
Columbia Steel Co.
Copperweld Steel Co.
Crescent Ins. Wire & Cable Co.
Crucible Steel Co. of America
General Cable Corp.
General Elec. Co.
Graybar Elec. Co., Inc.
Hazard Ins. Wire Works
Indiana Steel & Wire Co.
Marwood Limited
Maydwell & Hartzell, Inc.
The Okonite Co.
Okonite-Callender Cable Co.
Providence Insulated Wire Co.
John A. Roebling's Sons Co.
Triangle Conduit & Cable Co., Inc.
United States Steel Corp.
Westinghouse Elec. & Mfg. Co.

**Carbon Brushes**
National Carbon Co., Inc.
Union Carbide & Carbon Corp.

**Carbon Products**
National Carbon Co., Inc.
Union Carbide & Carbon Corp.

**Chimes**
Copperweld Steel Co.
Square D Co.

**Clamps, Ground**
Copperweld Steel Co.
B. Hartman
Reliable Elec. Co.

**Clocks, Program**
Tork Clock Co., Inc.

**Coffee Makers**
The Silex Co.

**Coil Winding**
Jeffries Transformer Co.

**Commutator Dressers**
Ideal Commutator Dresser Co.

**Compounds, Insulating**
Clifton Mfg. Co.
John C. Dolph Co.
General Cable Corp.
General Elec. Co.
Irvington Varnish & Insulator Co.

**Condensers, Electric**
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

**Conduit**
Aluminum Co. of America
General Elec. Co.
Triangle Conduit & Cable Co., Inc.
Youngstown Sheet & Tube Co.

**Conduit, Flexible Metallic**
General Elec. Co.
Triangle Conduit & Cable Co., Inc.
Wiremold Co.

**Conduit, Underground**
Fire Proof Wall Co.
Johns-Manville Corp.

**Connectors**
Burndy Eng'g Co.
Electric Power Equip. Corp.
G & W Elec. Specialty Co.
James R. Kearney Corp.
W. N. Matthews Corp.
Reliable Elec. Co.
L. W. Thompson

**Controllers**
Allis-Chalmers Mfg. Co.
General Elec. Co.
Square D Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg. Co.

**Cutouts**
G & W Elec. Specialty Co.
General Elec. Co.
James R. Kearney Corp.
Line Material Co.
W. N. Matthews Corp.
Pacific Elec. Mfg. Corp.
Schweitzer & Conrad, Inc.
Westinghouse Elec. & Mfg. Co.

**Demand Control**
General Elec. Co.
Wesix, Inc.

**Distribution Specialties**
G & W Elec. Specialty Co.
General Elec. Co.
Hubbard & Co.
James R. Kearney Corp.
Maydwell & Hartzell, Inc.
Ohio Brass Company
St. Louis Malleable Casting Co.
Superior Switchboard & Devices Co.
Waltham, De Witt & Krusi

**Electrodes, Arc Welding**
General Elec. Co.
John A. Roebling's Sons Co.

**Enclosures, Meter and Instrument**
Superior Switchboard & Devices Co.

**Fans**
General Elec. Co.
Kisco Co., Inc.
Smallcomb Elec. Co.

**Farm Electrification Equipment**
General Elec. Co.

**Fittings, Conduit**
General Elec. Co.
B. Hartman
Killark Elec. Mfg. Co.

**Fittings, Insulator**
Brewer-Titchener Corp.
Ohio Brass Company

**Fixtures, Lighting**
Benjamin Elec. Mfg. Co.
Curtis Lighting, Inc.
General Elec. Co.
Pittsburgh Reflector Co.
Smoot-Holman Co.
Westinghouse Elec. & Mfg. Co.

**Floodlighting**
Curtis Lighting, Inc.
General Elec. Co.
Pittsburgh Reflector Co.
S & M Lamp Co., Inc.
Smoot-Holman Co.
Westinghouse Elec. & Mfg. Co.

NUTYPE

## MATTHEWS CONDUCTOR CONNECTORS

◆

**Made in two styles for electrical connections**

NUTYPE—Split Bolt Type, made in 8 sizes, for No. 10 and smaller, to No. 4/0 copper wires, 97 to 99% copper content, great strength and ease of installation are features.

UNIVISE—"One-piece" type, made in 7 sizes, for No. 10 and smaller, to No. 4/0 copper wires. Cannot come apart or be cross threaded. High strength, 97% copper content metal used throughout. Easily connected and disconnected.

BOTH types eliminate the use of solder in any type of electrical wire connection. Samples and bulletins giving complete information will be sent on request.

**W. N. Matthews Corp.** St. Louis, Mo.

UNIVISE

**Generators**
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

**Graphite Products**
National Carbon Co., Inc.
Union Carbide & Carbon Corp.

**Ground Rods**
Copperweld Steel Co.
Maydwell & Hartzell, Inc.

**Heaters, Air**
Edison Gen. Elec. Appliance Co.
Noblitt-Sparks Industries, Inc.
Thermador Elec'l Mfg. Co.
Wesix Elec. Heater Co.
Edw. L. Wiegand Co.

**Heaters, Water**
Edison Gen. Elec. Appliance Co.
The Electric Heater Co.
Electro Hot Heater Co.
Standard Elec. Mfg. Corp.
Thermador Elec'l Mfg. Co.
Wesix Elec. Heater Co.
Westinghouse Elec. & Mfg. Co.
The Woolwine-Norris Corp.

**Heating Element—Repair Part**
Montgomery Bros.
Edw. L. Wiegand Co.

**Instruments, Measuring and Recording**
See Ammeters, Voltmeters, Wattmeters.

**Insulation**
General Elec. Co.
Irvington Varnish & Insulator Co.
Johns-Manville Corp.

**Insulators**
Brewer-Titchener Corp.
Condon & Young, Inc.
Corning Glass Works
Graybar Elec. Co., Inc.
Hemingray Glass Co.
Geo. E. Honn Co.
Lapp Insulator Co., Inc.
Locke Insulator Corp.
Maydwell & Hartzell, Inc.
Ohio Brass Company
Owens-Illinois Glass Co.
Westinghouse Elec. & Mfg. Co.

**Ironers**
Easy Washing Machine Corp.
Edison Gen. Elec. Appliance Co.
General Elec. Co.
Norge Division, Borg-Warner Corp.
Westinghouse Elec. & Mfg. Co.

**Knobs, Tubes, Cleats**
Standard Elec'l Porcelain Mfrs.

**Lamp Guards**
McGill Mfg Co.

**Lamp Replacers**
G. C. A. Mfg. Co.

**Lamps, I. E. S.**
General Elec. Co.

**Lamps, Mazda**
General Elec. Co.
Westinghouse Lamp Co.

**Lamps, Sun**
General Elec. Co.

**Lighting Equipment**
Benjamin Elec. Mfg. Co.
Curtis Lighting, Inc.
Keese Eng'g Corp.
Kim Mfg. Co.
Smoot-Holman Co.
H. B. Squires Co.
Sterling Reflector Co.
Westinghouse Elec. & Mfg. Co.
Wuelker Lighting Co.

**Line Material**
Maydwell & Hartzell, Inc.
Ohio Brass Company

**Meters**
General Elec. Co.
Lincoln Meter Co.
L. A. Nott
Roller-Smith Co.
Sangamo Elec. Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec'l Instrument Corp.
T. S. Wood

**Motors**
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

**Motor Starters**
Allis-Chalmers Mfg. Co.
General Elec. Co.
Square D Co.
Westinghouse Elec. & Mfg. Co.

**Oil, Lubricating**
Shell Oil Co.
The Texas Co.

**Oil, Transformer & Switch**
General Elec. Co.
Shell Oil Co.
The Texas Co.

**Panel Boards**
General Elec. Co.
Mongerson's Elec'l Mach. Works
Square D Co.
Superior Switchboard & Devices Co.
Westinghouse Elec. & Mfg. Co.

**Photoelectric Cells**
General Elec. Co.
Weston Elec'l Instrument Corp.

**Pins, Wood**
Locust Pin Co.

Porcelain Housed Matthews Cutouts

## Matthews Fuswitches and Cutouts

**For Primary Distribution Transformer Fusing Protection**

Open Type Matthews Fuswitches

● Matthews Cutouts and Fuswitches are made in enclosed and Open Types, both dropout and non-dropout styles. Enclosed types furnished in 14 catalog numbers for all ratings to 200 amperes and 7500/12,500 GRD. Y volts.

Open types furnished in 20 catalog numbers for all ratings to 100 amperes and 23,000 volts.

Reclosing Fuswitches, convertible disconnecting blades for above Cutouts, and Disconnecting Switches in several styles are included in the complete line.

Matthews Universal Fuse Links supplied for above, will also fit other makes.

All above comply with new E.E.I.-N.E.M.A. 100% rating standards.

Write for complete descriptive catalog.

**W. N. MATTHEWS CORPORATION** St. Louis, Mo.

**G.C.A.**
**Lamp Replacers**
**Lamp base Removers**
**Cartridge Fuse Tongs**
**Switch Hooks**

*Send for Catalogue*

*We have been making safety tools for 20 years*

**The G. C. A. Manufacturing Co.**
**Pittsfield, Mass.**


**Pole Line Hardware**
Brewer-Titchener Corp.
General Electric Supply Corp.
Graybar Electric Co., Inc.
Hubbard & Company
Joslyn Co. of California
Kortick Mfg. Co.
Maydwell & Hartzell, Inc.
Ohio Brass Company

**Porcelain**
Standard Elec. Porcelain Mfrs.

**Public Utilities**
California Oregon Power Co.
Idaho Power Co.
The Montana Power Company
Mountain States Power Co.
Northwestern Electric Co.
Pacific Gas and Electric Co.
Pacific Power & Light Co.
Portland General Electric Co.
Puget Sound Power & Light Co.
Rocky Mt. Elec'l League
San Diego Cons. Gas & Elec. Co.
San Joaquin Light & Power Corp.
Southern California Edison Co. Ltd.
Utah Power & Light Co.
Washington Water Power Co.

**Pullers, Slack**
A. B. Chance Co.

**Pumps**
Pelton Water Wheel Co.

**Range Units**
Edison Gen. Elec. Appliance Co.
Edwin L. Wiegand Co.

**Ranges**
Edison Gen. Elec. Appliance Co.
General Elec. Co.
General Elec. Supply Corp.
Kelvinator Corp.
Landers, Frary & Clark
F. S. Lang Mfg. Co.
Malleable Iron Range Co.
Norge Division, Borg-Warner Corp.
Standard Elec. Mfg. Corp.
Westinghouse Elec. & Mfg. Co.
The Woolwine-Norris Corp.

**Reflectors**
Benjamin Elec. & Mfg. Co.
Curtis Lighting, Inc.
Sterling Reflector Co.
Reflector & Illuminating Co.
Smoot-Holman Co.
Westinghouse Elec. & Mfg. Co.
Wuelker Lighting Co.

**Refrigerators**
Edison Gen. Elec. Appliance Co.
Frigidaire Corp.
General Elec. Co.
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Kelvinator Corp.
Leonard Refrigerator Co.
Norge Division, Borg-Warner Corp.
Westinghouse Elec. & Mfg. Co.

**Relays**
General Elec. Co.
Roller-Smith Co.
Square D Co.
Ward Leonard Elec. Co.

**Rheostats & Resistors**
General Elec. Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg. Co.

**Rosaters**
National Enameling & Stamping Co.
Westinghouse Elec. & Mfg. Co.

**Rural Line Hardware**
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Hubbard & Co.
Joslyn Co. of Calif.
Kortick Mfg. Co.
Maydwell & Hartzell, Inc.
Ohio Brass Company

**Service Organizations**
Brookmire Corp.
Crocker First National Bank
Elec'l Testing Labs.
McGraw-Hill Book Co.
Northwest Elec. Light & Power Association
Pacific Coast Elec'l Bureau
Pacific Coast Elec'l Ass'n

**Strand, Guy**
Copperweld Steel Co.
Maydwell & Hartzell, Inc.
Pacific Wire Rope Co.

**Street Lighting Fixtures**
General Elec. Co.
Graybar Elec. Co., Inc.
Hubbard & Co.
Line Material Co.
Westinghouse Elec. & Mfg. Co.

**Switchboards**
Allis-Chalmers Mfg. Co.
General Elec. Co.
Mongerson's Elec'l Mach. Works
Roller-Smith Co.
Square D Co.

**Switches, Disconnect**
Electric Power Equip. Corp.
General Elec. Co.
Kearney Corp., James R.
Line Material Co.
Pacific Elec. Mfg. Corp.
Schweitzer & Conrad, Inc.
L. W. Thompson
Westinghouse Elec. & Mfg. Co.

**Switches, Fuse**
General Elec. Co.
Kearney Corp., James R.
Pacific Elec. Mfg. Corp.
Schweitzer & Conrad, Inc.

**Switches, Heater**
General Elec. Co.
Hart Mfg. Co.

**Switches, High Tension**
Bowie Switch Co.
James R. Kearney Corp.
Pacific Elec. Mfg. Co.

**Switches, Meter Test**
General Elec. Co.
Square D Co.
Superior Switchboard & Devices Co.

**Switches—Pressure and Temperature**
Square D Co.

**Switches, Remote Control**
General Electric Co.
Hart Mfg. Co.
Roller-Smith Co.

**Switches, Safety**
Colt's Patent Fire Arms Mfg. Co.
General Elec. Co.
McGill Mfg. Co.
Meyers Safety Switch Co., Inc.
Mongerson's Elec'l Mach. Works
Square D Co.
Westinghouse Elec. & Mfg. Co.

**Switches, Thermostat Controlled**
Colt's Patent Fire Arms Mfg. Co.
General Elec. Co.
Hart Mfg. Co.
Thermador Elec'l Mfg. Co.

**Switches, Time**
R. W. Cramer & Co., Inc.
General Elec. Co.
Maydwell & Hartzell, Inc.
Sangamo Elec. Co.

**Switchgear**
Allis-Chalmers Mfg. Co.
General Electric Co.
I-T-E Circuit Breaker Co.
Roller-Smith Co.
Westinghouse Elec. & Mfg. Co.

**Tapes—Friction and Rubber**
Clifton Mfg. Co.
Geo. E. Honn Co.

**Telephone & Telegraph Hardware & Specialties**
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Hubbard & Co.
Maydwell & Hartzell, Inc.

**Telephone Systems—Private**
American Automatic Elec. Sales Co.

**Terminals, Cable**
General Cable Corp.
General Elec. Co.

**Testing Devices**
Superior Switchboard & Devices Co.

**Tools**
Mathias Klein & Sons
Maydwell & Hartzell, Inc.

**Tools, Live Line**
A. B. Chance Co.
James R. Kearney Corp.
Sangamo Elec. Co.
Wiremold Co.

**Tools, Tree Trimming**
Bartlett Mfg. Co.

**Transformers**
Allis-Chalmers Mfg. Co.
American Transformer Co.
Gardner Elec. Mfg. Co.
General Elec. Co.
Jeffries Transformer Co.
Line Material Co.
Moloney Electric Co.
Western Transformer Co.
Westinghouse Elec. & Mfg. Co.

**Tubing, Elec'l Metallic**
Aluminum Co. of America
Youngstown Sheet & Tube Co.

**Turbines**
Allis-Chalmers Mfg. Co.
Pelton Water Wheel Co.
S. Morgan Smith Co.

**Valves**
Ohio Brass Company
Pelton Water Wheel Co.
S. Morgan Smith Co.

**Washers, Clothes**
Easy Washing Machine Corp.
Edison Gen. Elec. Appliance Co.
General Elec. Co.
Landers, Frary & Clark
Norge Division, Borg-Warner Corp.
Westinghouse Elec. & Mfg. Co.

**Wattmeters**
General Elec. Co.
L. A. Nott
Roller-Smith Co.
Sangamo Elec. Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec. Instrument Corp.

**Water Wheels**
Pelton Water Wheel Co.
S. Morgan Smith Co.

**Wire**
Aluminum Co. of America
American Steel & Wire Co.
Columbia Steel Co.
Copperweld Steel Co.
Crescent Ins. Wire & Cable Co.
Crucible Steel Co.
General Cable Corp.
General Electric Co.
Hazard Ins. Wire Works
Indiana Steel & Wire Co.
C. E. Ingalls
Keystone Steel & Wire Co.
Maydwell & Hartzell, Inc.
The Okonite Company
Pacific Wire Rope Co.
Providence Ins. Wire Co.
Rockbestos Products Corp.
John A. Roebling's Sons Co.
Triangle Conduit & Cable Co., Inc.
United States Steel Corp.
Westinghouse Elec. & Mfg. Co.
Wiremold Co.

**Wiring Supplies**
Airey Co., F. J. 9
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Irvington Varnish & Insulator Co.
Killark Elec. Mfg. Co.
McGill Mfg. Co.
Westinghouse Elec. Supply Co.

# ● INDEX TO ADVERTISERS

## APRIL, 1938


Allis-Chalmers Mfg. Co. ..... 13
Brewer-Titchener Corp., The ..... 18
Burndy Eng'g Corp., Inc. ..... 79
California Oregon Power Co. ..... 58, 59
Classified Section ..... 80
Copperweld Steel Co. ..... 24
Edison General Elec. Appliance Co., Inc. ..... 4, 5
Everstick Anchor Co. ..... 79
Gardner Elec. Mfg. Co. ..... 84
G.C.A. Mfg. Co. ..... 92
General Cable Corp. ..... 11
General Electric Co. ..... 2, 15, 16, 27, 28, 75
Hartman, B. ..... 85
Honn Co., Geo. E. ..... 82
Hubbard and Company ..... 84
Idaho Power Company ..... 58, 59
Indiana Steel & Wire Co. ..... 72
International Nickel Co., Inc., The ..... 3
Jeffries Transformer Co. ..... 85
Kearney Corp., James R. ..... 17
Klein & Sons, Mathias ..... 76
Lincoln Meter Co. ..... 72
Locke Insulator Corp. ..... 21
Malleable Iron Range Co. ..... 7
Matthews Corp., W. N. ..... 86, 91
Maydwell & Hartzell, Inc. ..... 86
Montana Power Company, The ..... 58, 59
National Carbon Co., Inc. ..... 10
National Enameling & Stamping Co. ..... 6
Ohio Brass Company ..... 9
Okonite Company, The ..... 8
Okonite-Callender Cable Co., Inc. ..... 8
Owens-Illinois Glass Co. ..... 14
Pacific Coast Electrical Bureau ..... Back Cover
Pacific Gas and Electric Co. ..... Inside Back Cover
Pacific Power & Light Co. ..... 58, 59
Pelton Water Wheel Co. ..... 78
Pittsburgh Reflector Co. ..... 73
Portland General Electric Co. ..... 58, 59
Professional Directory ..... 80
Puget Sound Power & Light Co. ..... 58, 59
Rocky Mountain Electrical League ..... 58, 59
Roebling's Sons Co., John A. ..... 22
Sangamo Electric Co. ..... 74
Schweitzer & Conrad, Inc. ..... 77
Shell Oil Company ..... 65
Smoot-Holman Co. ..... 68
Southern California Edison Co. Ltd. ..... Inside Front Cover
Square D Company ..... 69
Standard Elec. Mfg. Corp., The ..... 70
Sterling Reflector Co. ..... 88
Superior Switchboard & Devices Co., The ..... 67
Triangle Conduit & Cable Co., Inc. ..... 26
Union Carbide & Carbon Corp. ..... 10
Utah Power & Light Co. ..... 58, 59
Washington Water Power Co. ..... 58, 59
Westinghouse Electric & Mfg. Co. ..... 12, 19, 20, 23
Weston Elec'l Instrument Corp. ..... 25
Wiegand Co., Edwin L. ..... 80

ON April 21, the Electric Appliance Society will launch its 1938 Spring Refrigerator Campaign and all dealers within the radius of P. G. and E. electric territory are invited to tie in.

The campaign slogan will be "Pays for itself—then pays you", and the campaign advertising will dramatize and prove this slogan with convincing, factual copy.

Among the advertising mediums to be used are newspapers (one advertisement per week for four weeks); radio; free display cards; free publicity and clip sheets; truck banners on 1000 P.G. and E. trucks and service cars; and full size 24-sheet billposters.

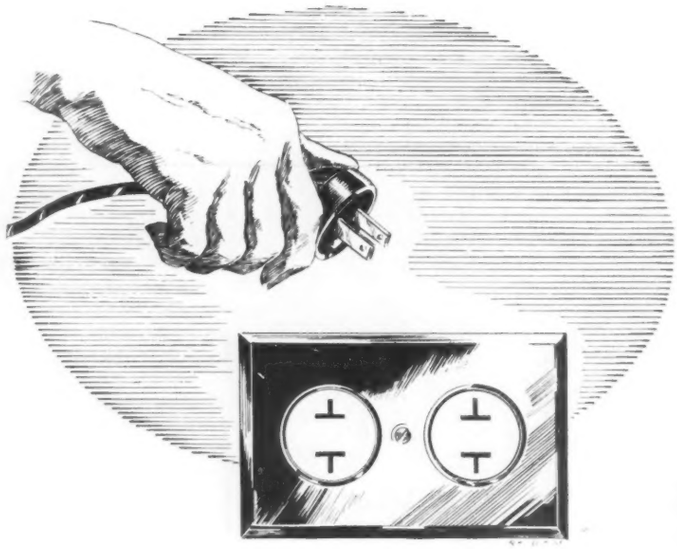
Watch your mail for the Electric Appliance Society's official campaign bulletin. See your newspapers for exact dates on which our ads will appear. Then plan your tie-in activities and—*follow through!*

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

*Owned · Operated · Managed by Californians*

EW 101-438



# We're still plugging away at the same old story of

# RED SEAL WIRING

That's our story and we're sticking to it because we have never heard a story more important to the electrical industry.

Mr. and Mrs. Dollarstretcher are not going to be prospects for appliances nor power unless they can use those appliances conveniently.

It's "tough going" to have to sell them a partial wiring job with each appliance. Let's sell them one adequate job and clear the tracks for use of any new appliances they may want to acquire.

Use every employee, every advertisement, and every piece of literature to add a word about adequate wiring.

*Pacific Coast Electrical Bureau*